



PREPARED BY:
Radian Corporation
10395 Old Placerville Road
Sacramento, California 95827

**DECEMBER 1988** 

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SOLID WASTE
ASSESSMENT TESTING

McCLELLAN AIR FORCE BASE

**FINAL** 

November 1987 to December 1988

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PREPARED FOR: HEADQUARTERS AFLC/DEV WRIGHT-PATTERSON AFB, OHIO 45433

United States Air Force Occupational and Environmental Health Laboratory (USAFOEHL) Technical Services Division (TS) Brooks Air Force Base, Texas 78235-5501

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McCLELLAN AIR FORCE BASE, CALIFORNIA SOLID WASTE ASSESSMENT TESTING

FINAL

HEADQUARTERS AFLC/DEV
WRIGHT-PATTERSON AFB, OHIO 45433

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Radian Corporation 10395 Old Placerville Road Sacramento, California 95827

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USAFOEHL Technical Program Manager J.E. Styles, 1st. Lt., USAF, BSC

United States Air Force
Occupational and Environmental Health Laboratory (USAFOEHL)
Technical Services Division (TS)
Brooks Air Force Base, Texas 78235-5501

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### PREFACE

Radian Corporation is a contractor for the RI/FS program at McClellan AFB, California. This work was performed for the USAF Occupational and Environmental Health Laboratory (USAFOEHL) under USAF Contract No. F33615-87-D-4023, Delivery Order 0006.

The background sections presented in this technical memorandum were developed for inclusion in the future RI report(s). The sections cover historical activities, as previously presented by other IRP contractors, site features, and contaminant characteristics at McClellan AFB.

Key Radian project personnel were:

Nelson H. Lund, P.E. -- Contract Program Manager Jack D. Gouge' -- Delivery Order Manager Morey Lewis, P.E. -- Project Manager Mark T. Galloway -- Task Leader

The work presented herein was accomplished between January 1988 and December 1988. 1st Lt, J.E. Styles, Technical Services Division, USAFOEHL, was the Technical Program Manager.

Approved:

Nelson H. Lund, P.E.

Contract Program Manager

Jack Gouge'

Delivery Order Manager

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#### 1.0 INTRODUCTION

This document reports the results of landfill testing performed at the McClellan Air Force Base (AFB) in compliance with the California Health and Safety Code Section 41805.5. This section requires the testing and preparation of a solid waste assessment report for all active California solid waste sites. McClellan AFB requested Radian Corporation to perform an investigation to evaluate inactive landfills, and Area D perimeter vapor wells and gas vent systems that are associated with the Area D clay cap at McClellan The testing reported in this document was performed in accordance with the procedures given in the "McClellan AFB Calderon Investigation Draft Quality Assurance Project Plan" (Radian, 1987). This quality assurance project plan (QAPP) was prepared in accordance with the requirements for landfill testing outlined in "Testing Guidelines for Active Solid Waste Disposal Sites" (California Air Resources Board, 1987). The QAPP was approved by a Sacramento County Air Pollution Control Officer and the U.S. Air Force prior to initiation of field testing activities. The testing was specifically designed to determine the gas generation and migration potential of landfills at the base, and to assess the impact, if any, of landfill gas on the atmosphere.

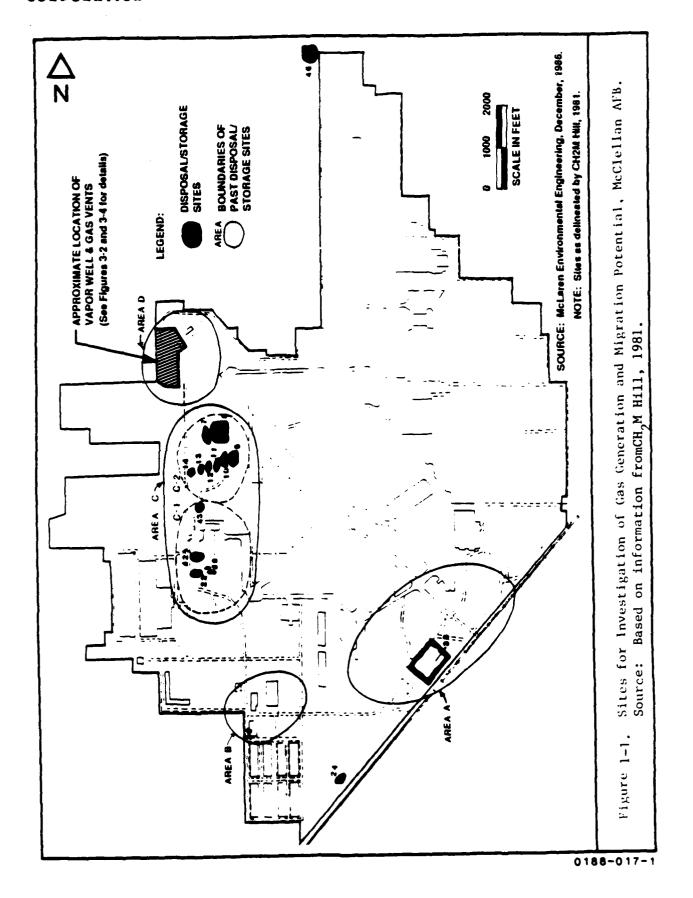
Thirteen inactive landfills were sampled. In addition, nine Area D perimeter soil-gas monitor wells and 14 gas vents located within the Area D cap were sampled. Figure 1-1 shows the approximate locations of these sites.

The landfills were evaluated for landfill gas generation and migration potentials only. No ambient air sampling was performed.

Tracer Research Corporation (TRC), a subcontractor to Radian Corporation, to performed the subsurface soil investigation and analytical activities of the testing program.

Section 2.0 of this document presents an overview of the sampling and analytical strategy used during the investigation. Analytical results also are presented. Section 3.0 provides a general description of the





landfill and other test sites that were investigated, and also provides information about the land use and population surrounding McClellan AFB. Section 4.0 presents a more detailed review of the sampling approach, including soil-gas probe installation, sampling procedures, and analytical procedures. Section 5.0 presents a summary of sampling and analytical results. A result summary is presented in Section 5.0 for those sites where sampling detected concentrations of any specified air contaminant compounds above the limit of quantitation. Section 5.0 also discusses the use of the limit of detection and limit of quantitation for data interpretation and briefly discusses quality assurance issues. Section 6.0 briefly discusses the status of remedial actions for each of the landfills and the Area D vapor wells and gas vent system test sites.

Appendix A presents the tabulated analytical results. Appendix B presents the raw analytical data, including quality assurance and quality control samples. Appendix C presents field notes and maps. Appendix D presents site photographs. And Appendix E presents the calculations used to estimate the volumes of air purged for the vapor wells and gas vents.

### 1.1 Project Description

Field testing at McClellan AFB included the collection of data to satisfy the gas generation and migration compliance requirements of the California Health and Safety Code Section 41805.5 (AB 3375, Calderon, 1984) for the 13 sites.

The field testing was designed to determine:

- The gas generation potential of each of the landfills investigated; and
- The gas migration potential of landfill gas from each of the landfills tested to the respective surrounding areas.

In general, the gas generation potential of each landfill was determined by installing and sampling of up to five ground probes per site to a depth of eight feet. Surface coverings were removed, where possible, to facilitate probe installation. At least one probe was installed in the center of each landfill site, and other probes were installed in other areas of the landfill. The soil-gas samples were analyzed for methane, carbon dioxide, oxygen, nitrogen, and other specified air contaminant compounds which are listed in Table 1-1. These specified air contaminant compounds are based on Attachment 1 of the "Testing Guidelines for Active Solid Waste Disposal Sites" (California State Air Resources Board, 1987).

Gas migration potential was determined by installing and sampling perimeter landfill probes (with a maximum of three probes per landfill site). When appropriate, these perimeter probes were placed between landfills and in the direction of occupied structures. These soil-gas samples were analyzed for methane and the specified air contaminant compounds.

TABLE 1-1. SPECIFIED AIR CONTAMINANT COMPOUNDS ANALYZED IN SOIL-GAS SAMPLES

### Compound

Chloroethene (Vinyl Chloride)

### Benzene

- 1,2-Dibromoethane (Ethylene Dibromide)
- 1,2-Dichloroethane (Ethylene Dichloride)

Dichloromethane (Methylene Chloride)

Tetrachloroethene (Perchloroethylene)

Tetrachloromethane (Carbon Tetrachloride)

1,1,1-Trichloroethane (Methyl Chloroform)

Trichloroethene (Trichloroethylene)

Trichloromethane (Chloroform)



### 2.0 SUMMARY OF RESULTS

This section presents a brief overview of the sampling and analytical strategy used during the landfill testing and evaluation of the Area D perimeter vapor wells and gas vent system, which is within the Area D clay cap. This section also presents general analytical results of all landfill, soil-gas monitor well, and gas vent testing performed at McClellan Air Force Base (AFB). These results are summarized in Tables 2-1 through 2-15. Maximum values for site-specific analytical results that exceeded the limit of quantitation concentration are presented in Section 5.0. A discussion of the limit of quantitation (LOQ) criteria is presented in Section 5.1.2.

The tests performed included landfill gas characterization and gas migration testing. Ambient air testing for the landfills was not performed as part of the landfill testing program. Landfill gas characterization included screening emissions of the entire disposal area with a portable gas chromatograph containing a flame ionization detector, and landfill gas testing for specified air contaminant compounds (identified in Table 1-1), as well as methane, carbon dioxide, oxygen, and nitrogen at the center of each of the sites. Gas migration testing included landfill gas testing for the specified air contaminant compounds listed in Table 1-1, plus methane, carbon dioxide, oxygen, and nitrogen at perimeter locations at each of the sites.

The analytical procedure for the analysis of soil-gas used was a field gas chromatography technique developed and performed by Tracer Research Corporation of Tucson, Arizona. The technique provides immediate analysis of syringe samples collected directly from subsurface sampling probes after purging two probe volumes prior to sampling. The analytical detection limits and quality assurance activities demonstrated that the technique was sufficient to meet the testing objectives. Limits of detection and quantification were equal to or less than the detection limits for the specified air contaminant compoundsidentified in the "Testing Guidelines for Active Solid Waste Disposal Sites" (California Air Resources Board, 1987). The limits of detection, limits of quantitation, and analytical results are presented in Section 5.0. Results of tests conducted on landfill sites are discussed below:

TABLE 2-1. ANALYTICAL RESULTS OF SITE NO. 7 LANDFILL GENERATION AND OFF-SITE GAS MIGRATION TESTS

	Detection		Lendfi	III - Sample	No.		Perimeter - Sample No
	Limit	7(1)	7(2)	7(3)	(4)2	7(5)	7(6)
Compound	(Addd)	(bpbv)	(Addd)	(vdqq)	(bbpv)	(Addd)	· (Aqdd)
Vinyl Chloride	18		90	9			<30
Benzene	22		<b>د10</b>				<10
Ethylene Dibromide	0.12		<0.3				<0.3
Ethylene Dichloride	<b>5</b>		<20				<20
Methylene Chloride	52	3,000	<30		2,000	3,000	100
Perchloroethylene	0.14		09				<0.0>
Carbon Tetrachloride	0.029		<0.03				0.1
Methyl Chloroform	0.17		8.0				7.0
Trichloroethylene	0.17		01				-
Chloroform	0.38		<b>7.0</b> >				7.0
Methane (X)	0.29		<0.11				<0.11
Carbon Dioxide (X)	0.67		0.63				0.074
Xygen (X)	1.0		16				23
Nitrogen (%)	1.1		<b>9</b>				82

Detection Limit -- Same as the analytical detection limit presented in Table 5-1. These detection limit values were based on an aver-Detection limits for any single day may be lower than the average value. age detection limit for the field sampling period.

b Units are percent (X).

The following summary is presented to assist in using the tabulated analytical results in Appendix A and the raw analytical results in Appendix B. The second alpha character in the Field 10 No. SGB-7L designates a landfill or perimeter probe sample: L = landfill probe, P = perimeter probe.

	Date	Sampled	12/04/87	12/05/87	12/05/87	12/05/87	12/05/87	12/05/87
	Depth of	Probe	7.5		,,	7.5'	, œ	5,
	Field	ID No.	SG8 - 7L	SG9-7L	SG10-7L	SG11-7L	SG12-7L	SG13-7P
Sample No.	Reporting	1D Number	7(1)	7(2)	7(3)	7(4)	7(5)	7(6)

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TABLE 2-2. ANALYTICAL RESULTS OF SITE NO. 8 LANDFILL GENERATION AND OFF-SITE GAS MIGRATION TESTS

Detection	Detection		Landfill	- Sample No.			- 3	eter - Sample	e No.
Compound	Limit (ppbv)	8(2) (ppbv)	8(3) (ppbv)	(vdqq)	8(7) (ppbv)	8(8) (ppbv)	8(1) (ppbv)		8(5) (ppbv)
Vinyl Chloride	81	°10		08>	<20	-		l	<20
Benzene	13	<b>,</b>	<10	<30	7			<20	200
Ethylene Dibromide	0.12	<0°,3		<0.3	<0.05			Ą	<0.5
Ethylene Dichloride	5	<20 <sub>D</sub>		<20	<b>\$</b>			<200P	<b>.</b>
Methylene Chloride	72	<30		<30	<b>10</b>			<300	÷10
Perchloroethylene	0.13	1,000		300	06			200	07
Carbon Tetrachloride	0.029	<0.05		<0.0>	<0.01			<0.5	<b>c0.01</b>
Methyl Chloroform	0.17	700		۰	~			20	٥
Trichloroethylene	0.17	400		07	<b>4</b> 0			50	4
Chloroform	0.38	<b>**0</b>		<b>**</b> 0 <b>*</b>	*0.1			3	¢0.1
Methane (X)	0.29	<0.51		<0.54	<0.54			<0.51	<0.54
Carbon Dioxide (X)	79.0	1.2		1.2	0.18			0.11	0.07
Oxygen (X)	1.0	=		5	20			<b>5</b>	91
Nitrogen (X)	1.1	28		22	87			75	78

b Reagent blank did not meet the required detection limit of  $\leq 20$  ppbv on December 10, 1987.

C Units are percent (X).

The following summary is presented to assist in using the tabulated analytical results in Appendix A and the raw analytical results in Appendix B. The second alpha character in the Field 10 No. SGB-7L designates a landfill or perimeter probe sample: L = landfill probe, P = perimeter probe.

	Date	Sampled	12/10/87	12/10/87	12/10/87	12/10/87	12/11/87	12/11/87	12/11/87	12/11/87
	Depth of	Probe	7,5	8,	8	;	;	8,	٠,٢	8,
	Field	ID No.	SG39-8P	SG39-81	SG41-81	SG42-8P	S643-8P	18-7755	8645-81	18-9755
Sample No.	Reporting	10 Number	8(1)	8(2)	8(3)	8(4)	8(5)	8(6)	8(7)	8(8)

TABLE 2-3. AMALYTICAL RESULTS OF SITE NO. 10 LANDFILL GENERATION AND OFF-SITE GAS NIGRATION TESTS

Detection	Detection	Landfill - Sample No.	Pe	rimeter - Sample Ho	
Compound	Limit (ppbv)		10(1) (ppbv)	10(2) (ppbv)	10(3) (ppbv)
Vinyl Chloride	18	q	<20	<30	<b>~30</b>
Benzene	13	۵	9	<10	°10
Ethylene Dibromide	0.12	۵	<b>*0.0</b>	<0.3	<0.3
Ethylene Dichloride	18	۵	<b>10</b>	<20	<20
Methylene Chloride	75	۵	<10	<30	<30
Perchloroethylene	0.13	۵	0.09	<0.08	\$0.0°
Carbon Tetrachloride	0.029	۵	0.1	<0.03	<0.03
Methyl Chloroform	0.17	۵	7.0	<0.2	<0.2
Trichloroethylene	0.17	۵	7.0	4.0>	7.0>
Chloroform	0.38	۵	<0.2	7.0>	<b>*.0</b> >
Methane (X)	0.29	Δ	<0.11	<0.11	<0.11
Cerbon Dioxide (X)	0.67	۵	<0.05	0.12	0.15
Oxygen (%)	1.0	۵	23	50	22
Mitrogen (X)	1.1	Δ	82	28	90

b Field conditions prohibited sample collection.

C Units are percent (X).

The following summary is presented to assist in using the tabulated analytical results in Appendix A and the raw analytical results in Appendix B. The second alpha character in the Field 10 No. SGB-7L designates a landfill or perimeter probe sample: L \* landfill probe, P = perimeter probe.

Sampled 12/05/87 12/05/87 12/05/87 Date Depth of Probe 3 3 3 SG15-10P SG16-10P SG14-10P Field 10 No. Sample No. Reporting 1D Number 10(1) 10(2) 10(3)

TABLE 2-4. ANALYTICAL RESULTS OF SITE NO. 11 LANDFILL GENERATION AND OFF-SITE GAS MIGRATION TESTS

	Detection	Landfill : Sample No.	Perimeter - Sample No.	Sample No.
	Limit		11(1)	11(2)
Compound	(Addd)		(hqdd)	(Addd)
Vinyl Chloride	18	٩	<20	<30
Benzene	13	۵	9>	c10
Ethylene Dibromide	0.12	a	<0.0>	<0.1
Ethylene Dichloride	18	۵	<10	<20
Nethylene Chloride	24	a	<10	<20
Perchloroethylene	0.14	۵	<0.03	m
Carbon Tetrachloride	0.029	۵	<0.02	<0.02
Methyl Chloroform	0.17	۵	<0.08	9.0
Trichloroethylene	0.17	۵	<0.2	•
Chloroform	0.38	Δ	<0.2	<0.2
Methane (X)	0.29	۵	·	5.6
Carbon Dioxide (X)	0.67	۵	0.97	0.63
Oxygen (X)	1.0	۵	11	9.1
Nitrogen (%)	1.1	Δ	65	ž

b Field conditions prohibited sample collection.

C Units are percent (X).

The following summary is presented to assist in using the tabulated analytical results in Appendix A and the raw analytical results in Appendix B. The second alpha character in the field ID No. SG8-71 designates a landfill or perimeter probe sample: L = landfill probe, P = perimeter probe.

Sampled	Probe	10 No.	10 Number
12/05/87	6'	SG17-11P	11(1)
12/07/87	2'	SG26-11P	11(2)
Date	Depth of	Field	Sample No. Reporting



TABLE 2-5. ANALYTICAL RESULTS OF SITE NO. 12 LANDFILL GENERATION AND OFF-SITE GAS MIGRATION TESTS

	Detection	Landfill - Sample No.		Perimeter - Sample No	Semple No.	
	Limit		12(1)	12(2)	12(3)	12(4)
Compound	(bbpv)		(Addd)	(Agdd)	(Addd)	(bppv)
Vinyl Chloride	18	۵	<30	26,000	52,000	22,000
Benzene	13	۵	100	32,000	009>	1,000
Ethylene Dibromide	0.12	۵	*0.1	*	\$	<b>*0.0</b>
Ethylene Dichloride	<b>\$</b>	۵	<b>420</b>	<500	<200	₩
Nethylene Chloride	*	۵	<20	<b>009&gt;</b>	1,000	1,000
Perchloroethylene	0.14	۵	m	000'4	000.4	100
Carbon Tetrachloride	0.029	۵	<0.02	09	10	<0.02
Methyl Chloroform	0.17	۵	*	\$	90	~
Trichloroethylene	0.17	۵	4	8,000	2,000	200
Chloroform	0.38	٩	<0.2	2,000	0,4	-
Nethane (X)	0.29	۵	<0.46	3.7	1.9	4.5
Carbon Dioxide (X)	0.67	۵	0.29	1.3	1.2	0.32
Oxygen (%)	1.0	۵	17	3.0	7.7	6.1
Nitrogen (X)	1.1	۵	92	20	92	95

b Field conditions prohibited sample collection.

c Units are percent (%).

The following summary is presented to assist in using the tabulated analytical results in Appendix A and the raw analytical results in Appendix B. The second alpha character in the Field ID No. SGB-7L designates a landfill or perimeter probe sample: L = landfill probe, P = perimeter probe.

Sample No. Reporting ID Number 12(1)	Field 1D No. SG24-12P	Depth of Probe 5'	Date Sampled 12/07/87
12(2)	SG25-12P	2,	12/07/87
12(3)	SG64-12P	۰,	12/15/87
12(4)	SG65-12P	'n	12/15/87

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TABLE 2-6. ANALYTICAL RESULTS OF SITE NO. 13 LANDFILL GEMERATION AND OFF-SITE GAS MIGRATION TESTS

Detecti	Detection	on Perimeter - Sample No. Perimeter - Sample No.	Perimeter - Sample No.	Sample No.
	Limit	13(2)	13(1)	13(3)
punodero	(bpbv)	(bpbv)	(Appv)	(Addd)
vinyl Chloride	18	<30	<20	2,000
Benzene	13	<200	09>	009
Ethylene Dibromide	0.12	<0.2	٠٥.1	<0.2
Ethylene Dichloride	18	<20	<10	<b>~50</b>
Methylene Chloride	55	<30	<10	200
Perchloroethylene	0.14	0.2	4	•
Carbon Tetrachloride	0.029	<0.0>	<0.02	<0.05
Methyl Chloroform	0.17	9.0	0.8	7
Trichloroethylene	0.17	-	4	07
Chloroform	0.38	4.0>	<0.2	<b>7.0</b> >
Methane (%)	0.29	<0.21	<0.21	7.4
Carbon Dioxide (X)	0.67	0.2	0.91	2.8
OXYGEN (X)	1.0	46	4.6	8.4
Mitrogen (%)	1.1	76	87	55

Detection Limit -- Same as the analytical detection limit presented in Table 5-1. These detection limit values were based on an average detection limit for the field sampling period. Detection limits for any single day may be lower than the average value.

The following summary is presented to assist in using the tabulated analytical results in Appendix A and the raw analytical results in Appendix B. The second alpha character in the field 10 No. SGB-7L designates a landfill or perimeter probe sample: L = landfill probe, P = perimeter probe.

	Date	Sampled	12/04/87	12/04/87	12/04/87	
	Depth of	Probe	۶,	š	2,	
	Field	ID NO.	SG5 - 13P	SG6-13L	SG7-13P	
Semple No.	Reporting	10 Number	13(1)	13(2)	13(3)	

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b Units are percent (X).



TABLE 2-7. AMALYTICAL RESULTS OF SITE NO. 14 LANDFILL GENERATION AND OFF-SITE GAS MIGRATION TESTS

	Detection	Landfill	Semple No.	Per	imeter - Sample No	•
Compound	Limit (ppbv)	14(2) (ppbv)	14(3) (ppbv)	14(1) (ppbv)	14(4) (bpv)	14(5) (ppbv)
Vinyl Chloride	18	<10	<20	×10	<b>~</b> 50	, c20
Benzene	13	c10	⊽	¢10	09>	09>
Ethylene Dibromide	0.12	٠٥.1	¢0.1	40.1	٠٥٠	\$ <del>0</del> .1
Ethylene Dichloride	81	<20	<20	<20	<10	<10
Methylene Chloride	56	<30	100	<30	<10	<10
Perchloroethylene	0.14	<0.2	10	0.2	0.1	7.0
Carbon Tetrachloride	0.029	0.05	<0.02	90.0	0.1	<0.02
Methyl Chloroform	0.17	<0.2	•	<0.2	4.0	0.6
Trichloroethylene	0.17	4.0>	~	<b>4.0</b> >	<0.2	<0.5
Chloroform ,	0.30	4.0>	07	4.0>	<0.2	<0.2
Methane (X)	0.29	<0.51	<0.42	<0.51	<0.21	<2.1
Carbon Dioxide (X)	0.67	<b>&lt;2.</b> 1	5.3	<2.1	<0.091	0.22
Oxygen (%)	1.0	12	11	14	22	20
Mitrogen (X)	1.1	2	82	23	*	79

The following summary is presented to assist in using the tabulated analytical results in Appendix A and the raw analytical results in Appendix 8. The second alpha character in the Field ID No. SG8-7L designates a landfill or perimeter probe sample: L = landfill probe, P \* perimeter probe.

	Dete	Sampled	12/02/87	12/02/87	12/03/87	12/04/87	12/04/87
	Depth of	Probe	, 9	5.5	8,	5.25	5.5
	Field	ID No.	SG1-14P	SG2-141	SG28-14L	SG3-14P	SG4-14P
Sample No.	Reporting	1D Number	14(1)	14(2)	14(3)	14(4)	14(5)



TABLE 2-8. AMALYTICAL RESULTS OF SITE NO. 22 LANDFILL GENERATION AND OFF-SITE GAS MIGRATION TESTS

	Detection		Lendfill -	Sample No.		Perimeter - Sample No.
	Limit	22(1)	22(2)	22(3)	22(5)	22(4)
Compound	(bdbv)	(pppv)	(Addd)	(bppv)	(bpbv)	(hqdd)
Vinyl Chloride	81	<10	<10	<30	000,4	د10 د
Benzene	13	9	9>	٠10	-	9>
Ethylene Dibromide	0.12	¢0,1	<0,1	£ <sup>7</sup> 0>	<0,3	*0°1
Ethylene Dichloride	81	, 50 <sub>0</sub>	<20 <sub>D</sub>	420 <sub>6</sub>	<20 <sub>D</sub>	<20 <sub>B</sub>
Methylene Chloride	72	<b>6</b> 20	<20	<30	<30	<20
Perchloroethylene	0.14	<b>*0.0</b> *	30	m	m	9
Carbon Tetrachioride	0.029	<0.05	<0.02	<0.0>	<0.0>	<0.02
Methyl Chloroform	0.17	*	4	~	<0.2	60
Trichloroethylene	0.17	07	10	•	007	007
Chloroform	0.38	<0.2	<0.2	7.0>	<b>7.0</b> >	<0.2
Nethane (X)	0.29	<0.51	<0.51	<0.51	<0.51	<0.51
Carbon Dioxide (X)	79.0	1.1	0.91	0.18	0.17	0.055
Oxygen (%)	1.0	7.2	7.5	6.9	4.5	15
Nitrogen (X)	1.1	2	9	79	88	89

Reagent blank did not meet the required detection limit of <20 ppbv on December 10, 1987.

C Units are percent (%).

The following summary is presented to assist in using the tabulated analytical results in Appendix A and the raw analytical results in Appendix B. The second alpha character in the Field 10 No. SG8-7L designates a landfill or perimeter probe sample: L = landfill probe, P = perimeter probe.

	Date	Sampled	12/10/87	12/10/87	12/10/87	12/10/87	12/10/87
	Depth of	Probe	۲،	8,	,,	۶,	èo
	Field	ID No.	SG34-22L	SG35-22L	SG36-22L	SG37-22P	SG38-22L
Sample No.	Reporting	10 Number	22(1)	22(2)	22(3)	22(4)	22(5)

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TABLE 2-9. ANALYTICAL RESULTS OF SITE NO. 24 LANDFILL GENERATION AND OFF-SITE GAS MIGRATION TESTS

	Detection		tandfill -	Semple No.		Perimeter -	Semole No.
-	Limit	24(3)	24(4)	24(5)	24(6)	24(1)	24(2)
Compound	(Aqdd)	(Agdd)	(Agdd)	(Agdd)	(Addd)	(Agdd)	(Agdd)
Vinyl Chloride	18	<20		<20	<20	<20	<20
Benzene	13	10		10	10	10	9
Ethylene Dibromide	0.12	<0.08		<0.08	<0.08	<0.08	\$0.0°
Ethylene Dichloride	18	¢10	<10	<10	¢10	<10	<b>د10</b>
Methylene Chloride	77	<20		<20	<b>4</b> 50	<20	<20
Perchloroethylene	0.14	<b>*0.0</b> *		m	<b>*0.0</b> *	~	•
Carbon Tetrachloride	0.029	<0.02		<0.02	<0.02	<0.0>	0.5
Methyl Chloroform	0.17	10		200	7	~	0.8
Trichloroethylene	0.17	80		07	7	20	20
Chloroform	0.38	<0.2		<0.2	<0.2	<0.2	<0.2
Methane (X)	0.29	<0.58		<0.58	<0.58	<0.58	<0.58
Cerbon Dioxide (X)	0.67	0.068		1.2	0.27	<0.27	<0.27
Oxygen (%)	1.0	87		6.9	02	19	19
Nitrogen (X)	1.1	7		92	22	22	52

b Units are percent (X).

The following summary is presented to assist in using the tabulated analytical results in Appendix A and the raw analytical results in Appendix B. The second alpha character in the field ID No. SGB-7L designates a landfill or perimeter probe sample: L = landfill probe, P = perimeter probe.

	Date	Sampled	12/14/87	12/14/87	12/14/87	12/14/87	12/14/87	12/14/87
	Depth of	Probe	۶,	'n	œ,	κ̈	è	ň
	Field	ID NO.	SG58-24P	SG59-24P	2660-241	SG61-24L	2662-241	2663-241
Sample No.	Reporting	10 Number	24(1)	24(2)	24(3)	54(4)	24(5)	54(6)

TABLE 2-10. ANALYTICAL RESULTS OF SITE NO. 38 LANDFILL GENERATION AND OFF-SITE GAS MIGRATION TESTS

	Detection		Lendfill -	Sample No.		Perimeter	- Semple No.
Compound	Limit (ppbv)	38(1) (ppbv)	38(2) (ppbv)	38(3) (ppbv)	38(4) (ppbv)	38(5) (ppbv)	38(6) (ppbv)
Vinyl Chloride	18	<20	<200	<200	<20	<b>.</b>	۵
Benzene	13	\$	09>	09>	<20	۵	۵
Ethylene Dibromide	0.12	<0.05	<0.5	<0.5	<0.05	۵	۵
Ethylene Dichloride	5	<b>.</b>	<b>~80</b>	<b>80</b>	89	۵	۵
Methylene Chloride	54	<10	<100	<100	<b>10</b>	۵	۵
Perchloroethylene	0.14	300	06	96	<0.02	۵	۵
Carbon Tetrachloride	0.029	<0.01	∞	٠٥.1	<0.01	۵	۵
Methyl Chloroform	0.17	10	100	•	0.8	۵	4
Trichloroethylene	0.17	20	100	10	4	۵	£
Chioroform	0.38	<0.1	₹	Ç	<0.1	Δ	۵
Nethane (X)	0.29	<0.54	<0.54	<0.54	<0.54	۵	۵
Carbon Dioxide (X)	29.0	0.57	<0.13	<0.14	0.25	۵	۵
Oxygen (X)	1.0	9.6	17	17	20	۵	۵
Nitrogen (X)	1.1	58	98	ž	*	۵	Δ.

b Field conditions prohibited sample collection.

C Units are percent (%).

The following summary is presented to assist in using the tabulated analytical results in Appendix A and the raw analytical results in Appendix B. The second alpha character in the field ID No. SG8-7L designates a landfill or perimeter probe sample: L = landfill probe, P = perimeter probe.

	Date	Sampled	12/11/87	12/11/87	12/11/87	12/11/87	3,	
	Depth of	Probe	,9	; 7	.,	2،	= water at	:
	Field	ID No.	SG54-38L	SG55-38L	SG56-38L	SG57-38L	(No sample)	:
Sample no.	Reporting	ID Number	38(1)	38(2)	38(3)	38(4)	38(5) (	38(6)



TABLE 2-11. AMALYTICAL RESULTS OF SITE NO. 42 LANDFILL GENERATION AND OFF-SITE GAS MIGRATION TESTS

	Detection		ten	dfill - Semple	No.		Perimeter - Sample No.
	Limit	42(1)	(2)25	(5)25	42(4)	42(5)	
Compound	(pppv)	(Addd)	(pppv)	(vddd)	(ppbv)	(pppv)	
Vinyl Chloride	2	<200	<b>420</b>		<b>~</b> 50	¢50	۵
Benzene	13	09>	9		9	9	۵
Ethylene Dibromide	0.12	<0.5	<0.0>	<0.5	<0.0>	<0.0>	Δ
Ethylene Dichloride	18	<b>80</b>	8>		<b>48</b>	89	۵
Methylene Chloride	72	×100	<10		<10	<10	۵
Perchloroethylene	0.14	30	m		m	•	Δ
Carbon Tetrachloride	0.029	<0.1	<0.01		<0.01	<0.01	۵
Methyl Chloroform	0.17	200	7		01	7.0	۵
Trichloroethylene	0.17	200	80		07	4	۵
Chloroform	0.38	⊽	<b>.</b> 0.1		<b>c</b> 0.1	<b>*0.1</b>	۵
Methane (X)	0.29	<0.54	<0.54		<0.54	<0.54	۵
Carbon Dioxide (X)	79.0	1.0	0.63		0.68	<0.25	۵
Oxygen (%)	1.0	18	15		17	12	۵
Witrogen (X)	1.1	87	89		78	28	۵

b field conditions prohibited sample collection.

C Units are percent (X).

The following summary is presented to assist in using the tabulated analytical results in Appendix A and the raw analytical results in Appendix B. The second alpha character in the field 10 No. SG8-71 designates a landfill or perimeter probe sample: L = landfill probe, P = perimeter probe.

Sample No.

Reporting	Field	Depth of	Date
ID Number	ID NO.	Probe	Sampled
42(1)	124-451	,7	12/11/87
(2)25	S648-42L	,,	12/11/87
42(3)	S649-42L	'n	12/11/87
42(4)	SG50-42L	۰,	12/11/87



TABLE 2-12. AMALYTICAL RESULTS OF SITE NO. 43 LANDFILL GENERATION AND OFF-SITE GAS MIGRATION TESTS

	Detection		Lendfill	Sample No.		Perimeter -	Semple No.
	Limit	(3(5)	(3)(4)	(2)(6)	43(1)	43(3)	43(5)
Compound	(Add)	(bppv)	(bbpv)	(Addd)	(Addd)	(Aqdd)	(pdpv)
Vinyl Chloride	81	<30	<30	<30	<30	<30	<30
Benzene	13	<b>10</b>	009	<b>10</b>	30	¢10	<b>610</b>
Ethylene Dibromide	0.12	6.1	-0.1	<0.1	٠٥.1	٠٥.1	<b>c0.1</b>
Ethylene Dichloride	18	<20	<20	<20	<20	<20	<20
Methylene Chloride	77	<20	<20	<20	<20	<20	<20
Perchloroethylene	0.14	_	<0.04	9.0	-	<b>*0.0</b> *	<b>*0.0</b> *
Carbon Tetrachloride	0.029	<0.0	0.1	<0.02	<0.0>	1.0	<0.03
Methyl Chloroform	0.17	0.2	7.0	<0.8	0.2	9.0	7.0
Trichloroethylene	0.17	~	~	•	_	•	-
Chloroform	0.38	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Hethane (X)	0.29	<0.46	<0.46	97.0>	<b>97.0&gt;</b>	<b>97.0</b> >	<0.46
Carbon Dioxide (X)	29.0	0.68	0.21	0.057	0.21	0.18	0.08
Oxygen (X)	1.0	16	13	20	6	16	16
Nitrosen (%)		68	77	87	88	82	99

b Units are percent (X).

The following summary is presented to assist in using the tabulated analytical results in Appendix A and the raw analytical results in Appendix 8. The second alpha character in the field 10 No. SGB-71 designates a landfill or perimeter probe sample: L = landfill probe, P = perimeter probe.

	Date	Sampled	12/07/87	12/07/87	12/07/87	12/07/87	12/07/87	12/07/87	
	Depth of	Probe	5.5		۲,	ż	,,	,,	
	field	ID No.	SG18-43P	SG19-43L	SG20-43P	SG21-43L	SG22-43P	\$623-431	
Sample No.	Reporting	10 Number	43(1)	43(2)	43(3)	43(4)	43(5)	43(6)	

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TABLE 2-13. AMALYTICAL RESULTS OF SITE NO. 69 LANDFILL GENERATION AND OFF-SITE GAS MIGRATION TESTS

	Detection	:		Landfill - S	ample No.			Perimeter -	Semple No.
	Limit	69(1)	(£)69	(7)69	(5)69	(9)69	(2)69	69(2)	(8)69
Compound	(bdpv)	(bppv)	(bbbv)	(bppv)	(vdqq)	(bppv)	(bpbv)	(bpbv)	(bbpv)
Vinyl Chloride	91	<20	007		<20	<20	<20		<b>410</b>
Benzene	13	<10	1,000		<10		<10		9>
Ethylene Dibromide	0.12	٠٥.1	4.0>		٠٥.1		٠٥٠1		<b>c0.1</b>
Ethylene Dichloride	18	<20	<50		<20		<20		<20
Nethylene Chloride	57	<20	09>		<20		<20		<20
Perchloroethylene	0.14	<0.06	<0.1		m		<0.0>		<b>*0.0</b> *
Carbon Tetrachloride	0.029	<0.03	<0.06		<0.03		<0.03		<0.02
Methyl Chloroform	0.17		-	~	4		-	7	4
Trichloroethylene	0.17	4	∞		20		4		9
Chloroform	0.38	<b>**0</b> *	9.0>		7.0>		<b>7.0</b> >		<0.2
Hethane (X)	0.29	<0.58	<0.58		<0.58		<0.58		<0.51
Carbon Dioxide (X)	29.0	<0.25	1.2		0.41		1.9		0.11
Oxygen (X)	1.0	20	8.8		16		19		16
Nitrogen (X)	-:	78	85		7.7		82		78

Units are percent (%).

The following summary is presented to assist in using the tabulated analytical results in Appendix A and the raw analytical results in Appendix B. The second alpha character in the Field ID No. SGB-7L designates a landfill or perimeter probe sample: L = landfill probe, P = perimeter probe.

	Date	Sampled	12/09/87	12/09/87	12/09/87	12/09/87	12/09/87	12/09/87	12/09/87	12/10/87
	Depth of	Probe	<i>`</i> ~	۶,	<b>%</b>	<b>%</b>	ò	89	89,	ř
	Field	ID No.	169-1255	SG28-69P	3629-69L	SG30A-69L	169-80£58	169-1255	169-2£98	SG33-69P
Sample No.	Reporting	10 Number	69(1)	(2)69	69(3)	(7)69	(5)69	(9)69	(2)69	69(8)



TABLE 2-15. ANALYTICAL RESULTS OF THE AREA D GAS VENT COLLECTION SYSTEM TESTS

							Gas V	ent - Ses	Tota No.						
	Detection VC1-3 VC-1	VC1-3	VC-NS. 1	VC2.3	VC2.7	Vc3.1	VC3. 5	VC3.7	VC3.9	VC4.1	VC4.2	VC4.4	VC6.1		VC6.3
Compound	Limit	Limit (ppbv)	اعا	[pppv]	(ppbv)	[bpbv]	[bbbv]	(ppbv)	(ppbv)	(pppv)	(pppv)	(ppbv)	(pptv)	(ppbv)	(ppbv)
Vinyl Chloride	19	80	<b>430</b>	<b>620</b>	620	<b>40</b>		30	c100	<b>40</b>	(SO		\$00	<b>~500</b>	<b>%</b>
Benzene	13	10	<b>610</b>	<del>1</del> 0	<b>.</b>	<b>430</b>	<b>6</b> 50	<b>410</b>	<b>6</b> 0	<b>30</b>	<del>1</del> 0	<b>6</b>	<b>1</b> 00	5	5
Ethylene Dibromide	0.12	<b>60.08</b>	<b>60.0</b> 6	<b>60.1</b>	<0.05	<b>60.4</b>		<b>60.1</b>	6,4	<b>&lt;0.4</b>	6.1		<0.8	<b>60.8</b>	<b>€0.</b> 0
Ethylene Dichloride	18	<b>10</b>	8	<b>6</b> 50	<b>æ</b>	<b>6</b> 5		<b>6</b> 50	<b>(</b> 20	<b>(50</b>	<b>(20</b>		<b>400</b>	400	20 20 20 20 20 20 20 20 20 20 20 20 20 2
Hethylene Chloride	24	<b>620</b>	6	<b>620</b>	<del>(1</del> 0	99		69	90	99	(20		<del>2</del> 00	800	<b>200</b>
Perchloroethy lene	0.14	<b>&lt;0.0</b>	0.9	<0.0	<b>0.6</b>	6.1		<b>60.1</b>	<b>0</b>	<b>60.10</b> 8	<b>&lt;0.0</b> 6		on.	<b>40</b> ,4	<b>6.4</b>
Carbon Tetrachloride		<0.02	<0.02	<0.03	<b>60.0</b> 1	<b>0°0</b> °		<0.0>	<b>40,09</b>	<b>40.</b> 06	<0.03		<0.0	<b>60</b> ,8	<0.2
Methyl Chloroform	0.17	Q	2	902	2,000	002		ø	80	2	50		2,000	1,000	904
Trichloroethylene	0.17	•		8	2,000	2	03	-	4	<b>&lt;0.6</b>	<b>60.</b> 8		80	7	40
Chloroform	0.38	<b>60.</b> 2	~	<b>&lt;0.4</b>	<b>6.1</b>	<b>.0.</b> 6	<b>9.0</b>	<0.2	<0 <b>.</b> 8	<b>40.6</b>	6.4		â	œ	ଖ
Methane (X)	0,29	<b>40.58</b>	~	<0.58	<0.54	<b>40.58</b>	<0.54	<b>.0,46</b>	<0.46	<b>.0.58</b>	<0.58		<b>40.58</b>	<0,58	<b>40.58</b>
Carbon Dioxide (X)	0.67	0.097	1.0	0.57	0.25		0.63	0.16	0.34	0.4	0.47		0.34	0.44	0.47
Oxygen (%)	1.0	19	3°5	16	11	7.8	7	50	<b>£</b>	16	16		47	17	45
Nitrogen (X)	1.1	72	75	£	73	84	e.	92	85	79	<b>.</b>		77	77	92

b Units are percent (%).

cation numbers. The range numbers can be used to review the analytical results in Appendix A and the raw analytical results in Appendix B. The WC" Analytical results for the gas vents located throughout the Area D clay cap area are identified by the same sample as reporting and field identifidesignation in the sample number corresponds to a "vent cap" on gas vent samples.

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TABLE 2-14. AWALYTICAL RESULTS OF THE AREA D SOIL-GAS MONITOR WELLS TESTS

					Vapor Monit	or Wells -	Sample No.			
	Dectection	VW-1	VM-2	VW-3	7-AA	S-MA	9-MA	7-M	8-NA	6-MA
Compound	Limit	(vqdd)	(bbbv)	(bbpv)	( Agdd)	( Agdd )	(bbpv)	(bbpv)	(bbpv)	(bpbv)
		1						]    - 		
Vinyl Chloride	18	<300					<30	<300		<300
Benzene	13	<100					<b>61</b> 0	<100		<100
Ethylene Dibromide	0.12	₽					<b>*0.0</b>	9.0>		<b>6.0</b> ×
Ethylene Dichloride	18	<200					<b>&amp;</b>	<b>~80</b>		<b>8</b> °
Methylene Chloride	54	<20					<b>\$</b>	06>		°490
Perchloroethlyene	0.14	7.0>					<0.03	06		<b>50</b>
Carbon Tetrachloride	0.029	m					<0.02	<0.2		<0.2
Methyl Chloroform	0.17	<0.8					5	800		<b>9</b>
Trichloroethlyene	0.17	\$	80	01	009	800	100	9,000	1,000	100
Chloroform	0.38	<b>~</b>					<0.2	<b>?</b>		<b>~</b>
Methane (X)	0.29	<b>97.0</b> >					<0.53	<0.53		<0.53
Carbon Dioxide (X)	0.67	<0.21					0.19	0.5		0.35
Oxygen (%)	1.0	20					11	2.8		7.6
Nitrogen (X)	1.1	78					69	<i>11</i>		92

Detection Limit--Same as the analytical detection limit presented in Table 5-1. These detection limit values were based on an aver-Detection limits for any single day may be lower than the average value age detection limit for the field sampling period.

b Units are percent (X).

sample numbers can be used to review the analytical results in Appendix A and the raw analytical results in Appendix B. The "VW" Analytical results for the soil-gas monitor wells are identified by the same sample reporting and field identification numbers. designation in the sample number corresponds to a vapor well sample.



- The emission screening survey using the organic vapor analyzer (OVA) did not detect landfill gases within three inches of the landfill surface at concentrations exceeding the background level of 3.5 ppmv total hydrocarbons calibrated as methane in air for any of the landfills tested or at the clay cap in Area D.
- Landfill gas testing detected some specified air contaminant compounds above the laboratory limit of quantitation. See Section 5.2 for further detail.
- Gas migration testing for the inactive landfill sites detected some specified air contaminant compounds above the limit of quantitation. Gas migration testing of the sites within the Area D cap was performed by sampling the 9 vapor wells and 14 on-site gas vents. See Section 5.3 for further detail.



### 3.0 DISPOSAL SITES DESCRIPTION

This section presents a general description of each of the disposal sites tested and the provides a general discussion of the land use in the areas within and adjacent to the McClellan Air Force Base (AFB). Figure 3-1 shows the locations of landfill sites and Area D where soil-gas testing was performed. Sites 7, 8, 10, 11, 12, 13, 14, 22, 42, 43, and 69 are within Area C designated in Figure 3-1. Site 38 is within Area A, Site 24 is within the designated Other Area, and the vapor wells and gas vents are within Area D. Individual site descriptions, maps, and sampling results are presented for each of the sites in Section 5.0. Table 3-1 presents a summary of the site names, descriptions, and dimensions.

### 3.1 Area D Vapor Monitor Well Sites and Gas Collection System

Two of the 13 sites tested are located within and adjacent to the Area D clay capped area. These vapor monitor wells and gas vents were constructed as part of a remedial action for Area D of McClellan AFB. Nine vapor monitor wells and 14 gas vents were sampled under this testing program. The locations of these vapor wells are presented in Figure 3-2. A schematic diagram of the Area D vapor well completion is presented in Figure 3-3. The locations of the Area D gas vent sampling are shown in Figure 3-4. Figure 3-4 also illustrates the pathway traveled during the site emission survey for Area D. Similar information is provided for the other sites in Appendix C.

### 3.2 Surrounding Land Use

### 3.2.1 Population

McClellan AFB is surrounded by three tract communities in Sacramento County. The communities surrounding the base include Rio Linda and Elverta to the northwest, North Sacramento to the west and southwest, and North Highlands to the east. All of these communities are. Rio Linda and North Highlands are unincorporated areas.



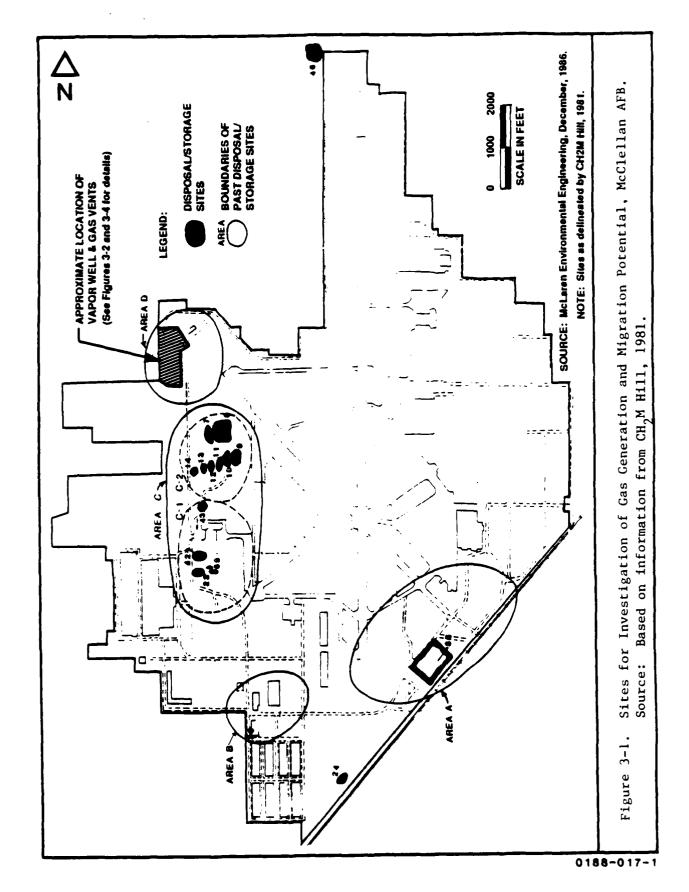


TABLE 3-1. INVESTIGATED SITES FOR GAS GENERATION AND MIGRATION POTENTIAL AT MCCLELLAN AFB

Si te	AFea	Description	Location	Dimensions (ft)	Identified Contaminants
_	J	Southludge/Oil Pit	East of Building 701	380 x 93 x 23	824/50/44
•	ပ	Southludge & Refuse Landfill	600 ft northwest of Building 774	435 x 135 x 20	VOC/BN
10	ပ	Landfill	500 ft west of Building 774	530 x 100 x 15	PP/PC8
=	ပ	Landfill	600 ft west of Building 774	9 × 08 × 507	4
12	ပ	Landfill	900 ft southwest of Building 774	610 x 90 x 12	4
13	u	Landfill	1,000 ft west of Building 774	600 × 90 × 15	<b>a</b>
7	ပ	Landfill	Wear Patrol Road, 300 ft south of Building 701	600 x 90 x 14	đ
22	ပ	Burn Pit & Landfill	South of IWTP Aeration Basin	400 × 100	PP/PCB/0G
54	Other	Landfill	East of Building 621	515 x 80 x 11	4
38	<	Underground Tanks/Sludge Landfill	Building 475	007 × 009	VOC/BN
75	U	Oil Southtorage/Landfill	Under INTP Aeration Basin	210 x 50 x 6	PP/06/PCB
43	u	Landfill	Northwest of Building 704	405 x 50 x 10	<b>a</b>
69	ပ	Burn Pit	SouthEast of Building 704	N/N	4
N/A	٥	Area D Vapor Wells	Perimeter of Area D	N/A	N/A
<b>4/8</b>	٩	Area D Gas Vent System	Perimeter & Interior of Area D	N/A	N/A

Key to identified contaminants:

BN \* Base/neutral priority pollutants

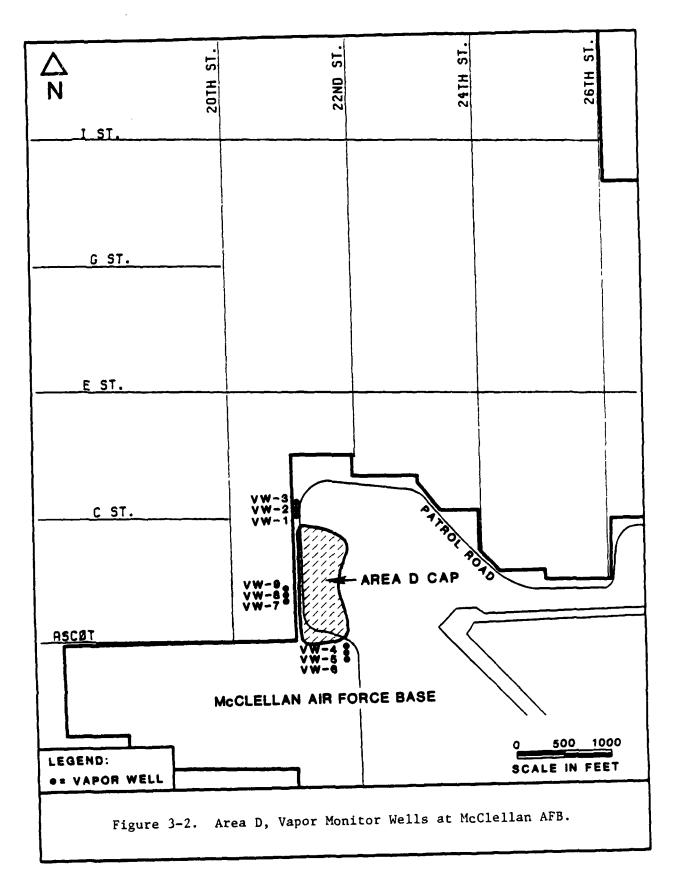
PCB = Polychlorinated biphenyls

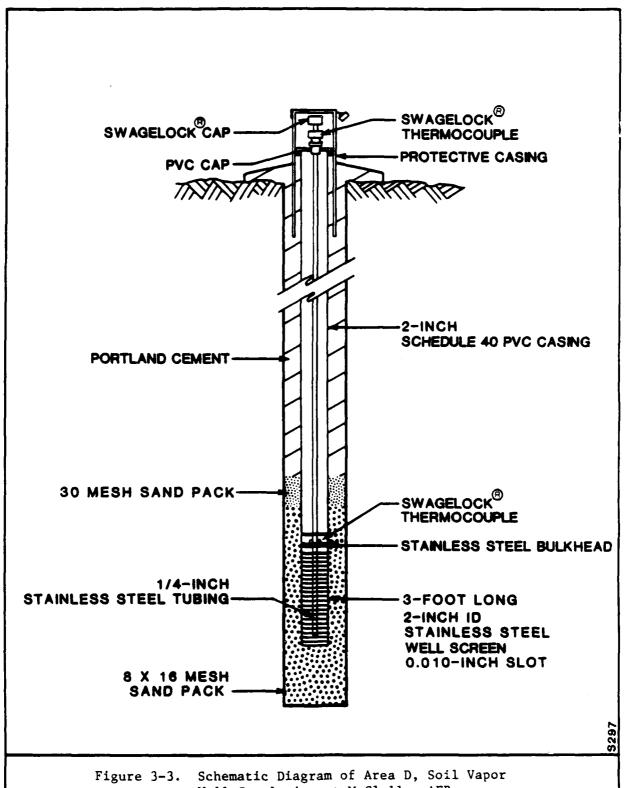
VOC = Volatile organic compounds

OG = Oil and grease PP = Priority pollutants

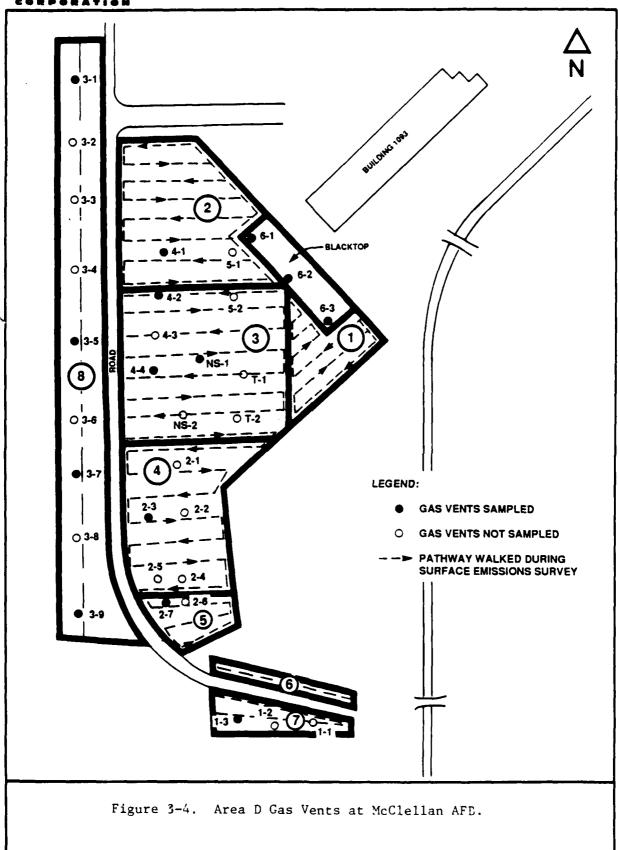
IWIP = Industrial Wastewater Treatment Plant

N/A = Not available





Well Completion at McClellan AFB.



0188-017-3



The population of the surrounding communities, as determined by the 1980 Census, is 107,822. A summary of population by community and tract number, as well as projected populations for the year 2005, is presented in Table 3-2. The tract areas presented in this table are shown in Figure 3-5.

#### 3.2.2 Land Use

Land use in the vicinity of the base consists of a complex combination of military, industrial, commercial, residential, and agricultural zones, as presented in Figure 3-6.

The majority of the land use surrounding the base is residential. In the Rio Linda area northwest of the base, most of the land is used for agricultural-residential purposes. This land category identifies areas that are reserved for large-lot, rural, residential uses where animals may be kept and crops may be raised for recreational, educational, personal consumption, or income-supplement purposes (Sacramento County, 1985).

Several Rio Linda lots directly adjacent to the base have been zoned as industrial-intensive. This land category identifies areas reserved for research, manufacturing, processing, and warehousing activities. Necessary public services, such as sewer and water systems, are available in industrial-intensive areas.

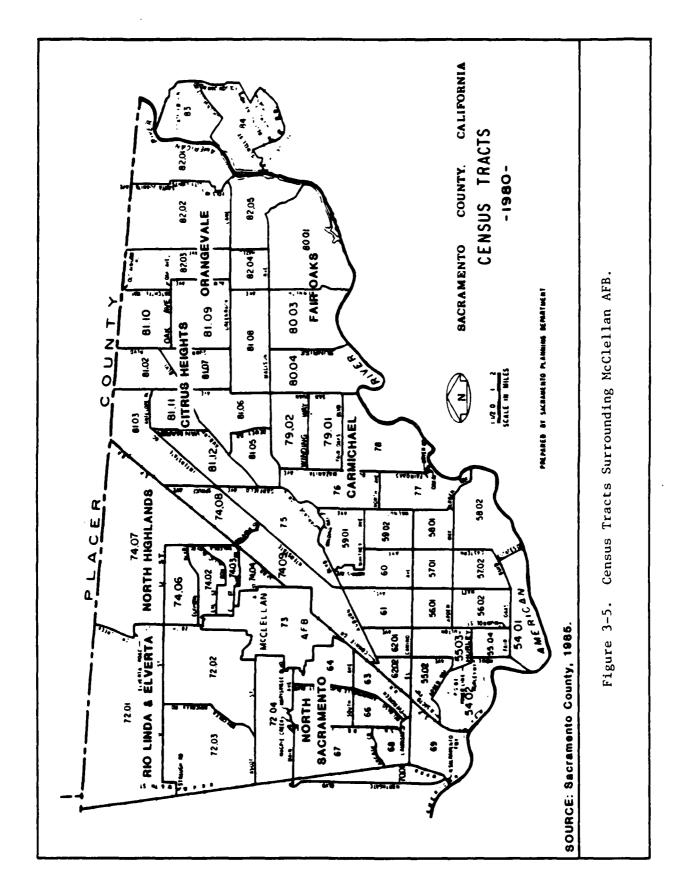
Most of the land use to the southwest and east of the base consists of low density residential zones. These areas are reserved for a planned population density range of 5 to 30 persons per acre, or a housing density range of 1 to 12 dwelling units per acre.

Also found to the southwest and east of McClellan AFB are parcels designated for commercial and office use. This land use category includes shopping centers, large office complexes, and major concentrations of strip commercial development.

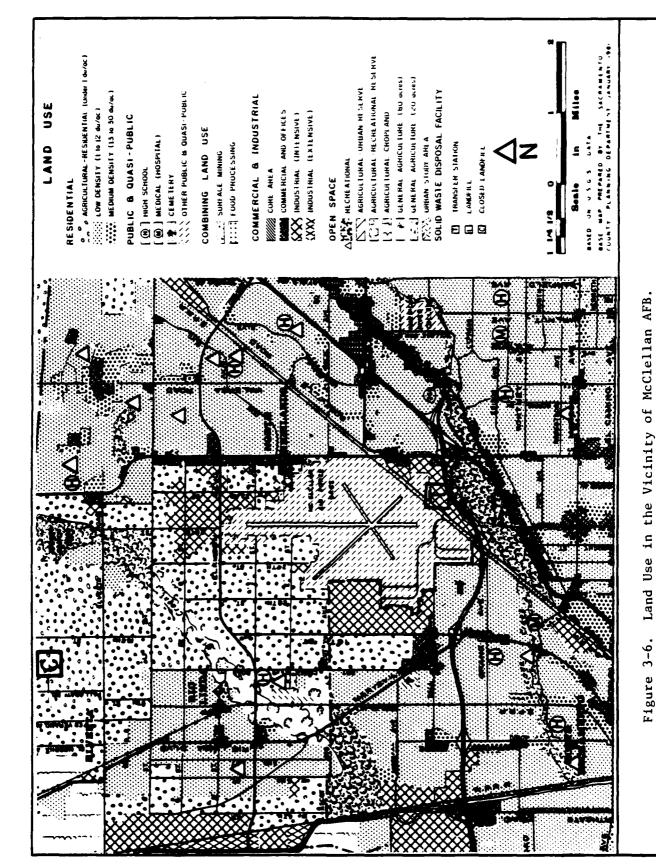
TABLE 3-2. POPULATION DATA AND PROJECTIONS FOR THE COMMUNITIES SURROUNDING McCLELLAN AFB

Tract Community	1980 Census Tract Number	Projected 2005 Population	Projected Population
Rio Linda and Elverta	72.01	3,689	
	72.02	3,547	
	72.03	6,737	
	TOTAL	13,973	26,529
North Highlands	73.00	1,541	
	74.02	6,207	
	74.03	4,451	
	74.04	3,511	
	74.06	7,044	
	74.07	7,959	
	74.08	9,819	
	74.09	7,262	
	75.00	11,010	
	TOTAL	58,804	118,861
North Sacramento	72,04	1,613	
	63.00	3,578	
	64.00	4,514	
	65.00	3,406	
	66.00	4,621	
	67.00	7,365	
	68.00	5,644	
	69.00	4,304	
	TOTAL	35,045	52,682

Source: Sacramento County, 1985.







1985

Sacramento County,

3-10

Del Paso Park, designated as a recreational area, is located within one mile southeast of the base. Additional agricultural-recreational reserve areas are located along Dry Creek, which is approximately two miles west of the base.

3-11

#### 4.0 MONITORING SYSTEM

This section describes the sampling and analysis methods used to collect and analyze soil-gas samples at the 13 inactive landfills.

#### 4.1 <u>Sampling Approach</u>

The objective of the sampling effort was to provide a preliminary characterization of the air emissions, landfill gas generation, and landfill gas migration potentials for 13 sites on base. The sampling approach was developed in accordance with the <u>Testing Guidelines for Active Solid Waste Disposal Sites</u> (California State Air Resources Board, 1987).

Screening of landfill emissions was conducted at the surface of each landfill using a Foxboro Corporation Model OVA-108 real-time organic-vapor analyzer. Screening for total hydrocarbon concentrations near the landfill surface was performed to identify areas of landfill gas emissions. This information was used to assist in the selection of soil-gas probe sampling locations, and to obtain representative gas generation and migration information.

To determine the composition of landfill gases, soil-gas probes were installed in the interior of each landfill (landfill soil-gas probes). It was proposed that each probe be installed to a depth of eight feet below the land surface. The locations of the probes within the landfill were selected to provide spatial coverage of the landfill. For some landfills with physical obstructions or barriers, this procedure was not possible. In the event that probes could be installed and sampled in the interior areas of the landfill, additional perimeter probes were installed and sampled. Landfill gas samples were analyzed for methane, fixed gases (carbon dioxide, nitrogen, and oxygen), and the 10 specified air contaminant compounds listed in Table 1-1.

To determine whether subsurface migration of landfill gas had occurred outside of the landfill boundary, soil-gas probes were installed on the perimeter of each landfill site (perimeter soil-gas probes). As required

by California Air Resources Board (ARB) guidelines, it was proposed that each perimeter soil-gas probe would be installed to a depth of six feet below the landfill surface. A frequency of one probe per 1,000 feet of perimeter was used when applicable. At least one perimeter probe was installed per site. The selection of perimeter ground probe locations considered the location and proximity of occupied buildings. One or more perimeter soil-gas probes was located between the landfill and any nearby buildings. In some cases, perimeter probes were used to further identify the perimeter of each landfill, augment characterization of landfill gas generation potentials, and identify the perimeter of a clustering of landfills located close to one another. Soil-gas samples taken from perimeter probes were analyzed for methane, carbon dioxide, nitrogen, oxygen, and the specified air contaminant compounds listed in Table 1-1.

Soil-gas sampling from the Area D vapor wells and gas collection systems was performed to determine if landfill gas generation and migration was occurring. Each of the 9 vapor monitor wells were sampled, and 14 of the 32 gas vents were sampled at random. Prior to sampling, a volume of air equivalent to two well volumes was purged from each of the wells and vents.

Prior to installation of landfill and perimeter soil-gas probes, sampling locations were checked against historical site data to accurately locate the landfill site in an effort to avoid buried pipelines, tanks, and electrical and water service. Base "digging permits" were obtained to ensure that soil-gas probes were located so as not to interfere with existing underground utilities. McClellan AFB Environmental Management (EM) personnel were often present to verify these clearances prior to initiation of the soil-gas probe installation. In addition, a Fisher m-scope pipe and cable locator were used as a final check prior to installing soil-gas probes. Landfill probe locations were generally selected along the centerline of each landfill area in order to minimize any error resulting from incorrectly identifying landfill locations from historical aerial photographs and site location maps. Landfill perimeter probe locations were selected based on approximate estimates for each landfill area but are most impacted from any error resulting from incorrectly identifying each landfill boundary. Therefore, the landfill perimeter probe locations and results should be evaluated from this perspective.

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#### 4.2 Probe Description

This section describes the sampling procedures for the soil-gas monitoring probes used at each of the 13 inactive landfill sites investigated. Figure 3-1 presents the locations of the 13 inactive landfills and identifies the approximate location of the vapor wells and gas vents in Area D. Individual site maps that present the sampling locations are found in Section 5.0.

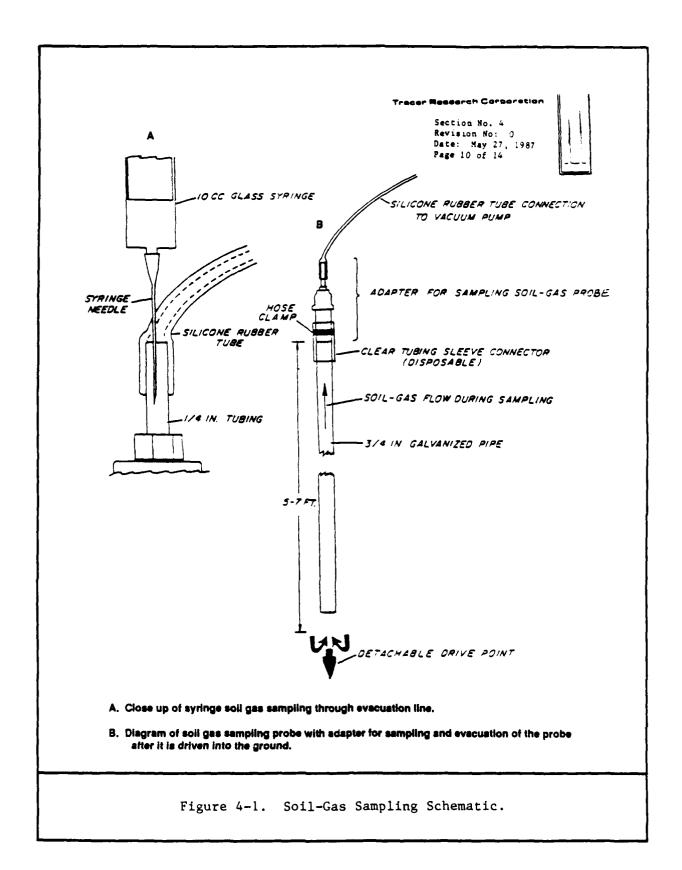
Landfill and perimeter probes were driven into the ground by a hydraulically driven pusher/puller mechanism. The probes were then purged by withdrawing two probe volumes using a vacuum pump. After purging, and while the soil gas was being drawn through the probe, a gas sample was taken using a glass syringe, which was inserted through a section of silicone tubing (leading to the pump) and into the stainless steel tubing in the adaptor. A schematic diagram of the probe, silicon tubing and syringe sampling system is presented in Figure 4-1. Gas samples only came into contact with steel surfaces and were never came into contact with potentially sorbing materials (e.g., tubing, hose, pump diaphragm). A vacuum gauge monitored the negative pressure in the evacuation line to determine if there was any impedance to the gas flow caused by the attempt to sample in clay or water-saturated soils.

One or two 10 ml gas samples were collected from each sampling probe after one to four minutes of pumping. These 10 ml samples were subsampled according to analytical requirements, and replicates were injected into the gas chromatograph for documentation of reproducibility. More than two injections may have been necessary where there were multiple contaminants that required different sample sizes for chromatographic analysis. The reproducibility of soil-gas samples from the same probe is typically within 20 percent and always within a factor of two.

Closure of the subsurface gas sampling sites involved removing the probe and filling the probe hole with native fill materials.

A brief description of the Tracer Research Standard Operating Procedure as performed in the field, is presented below:

# radian



#### Probe Placement

- A clean probe (pipe) was removed from the "clean" storage tube on top of the van.
- The soil-gas probe was placed in the jaws of the hydraulic pusher/puller mechanism.
- A drive point was attached to the bottom of the probe.
- A hydraulically driven pushing mechanism was used to drive the probe into the ground.
- If the mechanism would not drive the probe into the ground to a required depth for sampling, a hydraulically activated hammer was used to pound the probe into the ground.

#### Sample Extraction

- An adaptor was put onto the top of the soil-gas probe (see Figure 4-1[B]).
- A vacuum pump was hooked onto the adaptor and turned on and used to evacuate soil.
- For samples having evacuation pressures less than 15 inches of mercury, evacuation took at least 30 seconds, but never more than five minutes. Evacuation times were at least one minute, but no more than five minutes, for samples having evaluation pressures greater than 15 inches of mercury.
- Gauges on the vacuum pump were checked for excessive soil resistance by monitoring pressure reading (inches of

mercury). A reading of at least two inches of mercury less than maximum vacuum was used to extract sufficient soil gas to collect a valid sample.

#### Sample Collection

- With the vacuum pump running, a hypodermic syringe needle was inserted through the silicone rubber and into the stainless steel tubing of the adaptor (see Figure 4-1[A]).
- Gas samples only came into contact with steel surfaces, never with potentially sorbing materials (e.g., tubing, hose, pump diaphragm).
- The syringe was purged with soil gas. Without removing the syringe needle from the adaptor, a 2 to 10 ml soil-gas sample was collected.
- A second 10 ml sample was collected using the same procedure.

#### Demobilization

- The vacuum pump was turned off and disconnected from the adaptor.
- The adaptor was removed and stored with equipment to be cleaned.
- Using the hydraulically operated puller mechanism, the probe was removed from the ground.

- The probe was stored in the "used" probe tube on top of the van.
- The probe hole was backfilled, if required.
- A field log book was completed at the end of each day. The type of infromation supplied in this log book included:
  - Time (military notation) of sample;
  - Sample number;
  - Location of sample;
  - Sampling depth;
  - Evacuation time before sampling;
  - Inches of mercury on vacuum pump gauge;
  - Probe and adaptor numbers;
  - Number of sampling points used;
  - Observations (e.g., ground conditions, concrete, asphalt, soil appearance, surface water, odors, vegetation, etc.); and
  - Backfill procedure and materials, if used.
- Determination of Sampling Locations. The quality control procedures for reusable equipment usage are described below.

- Steel probes were used only once and then washed with high-pressure soap and hot water spray or steam-cleaned at the end of the day to eliminate the possibility of cross-contamination. Forty-two probes were carried on each van so that no probes would have to be reused during the day.
- Probe adaptors (steel reducer and tubing) were used once during the course of the day and cleaned at the end of each working day by baking in the gas chromotography oven. The tubing was replaced periodically as needed during the job to ensure cleanliness and good fit.
- Silicone tubing (connecting the adaptor to the vacuum pump) was replaced as needed to ensure proper sealing around the syringe needle. This tubing did not directly contact soil-gas samples.

Glass syringes were usually used for only one sample per day and were washed and baked-out at night. If they were used twice, they were purged with carrier gas (nitrogen) and baked-out between probe samplings.

- The septa through which soil-gas samples were injected into the chromatograph were replaced daily to prevent possible gas leaks from the chromatographic column.
- Subsampling syringes (2 cc) were checked for contamination prior to sampling each day by injecting nitrogen carrier gas into the gas chromatograph.
- All sampling syringes and 2 cc subsampling syringes were decontaminated each day, and none were reused before being decontaminated. Microliter-size subsampling syringes were reused only after a nitrogen carrier gas blank was run to ensure they were not contaminated by the previous sample.

- Soil-gas pumping was monitored by a vacuum gauge to insure that an adequate gas flow from the vadose zone was maintained.

#### 4.3 Analytical Instrumentation

Two Varian Model 3300 gas chromatographs were used for each gas analyses. The analysis of the non-fixed gas compounds was performed on one column with the electron capture detector and the photoionization detector placed in series. Specific instrumentation used for analyzing specific gases are described below:

- Carbon dioxide  $(CO_2)$ , oxygen  $(O_2)$ , nitrogen  $(N_2)$ , and methane  $(CH_4)$  were all analyzed on an Alltech CTR I column and analyzed by gas chromatography using a Thermal Conductivity Detector (TCD).
- Benzene and vinyl chloride were analyzed on a 6-foot by 0.125-inch column packed with 60/80 mesh 0.1% SP-1000 on Carbon B using a photoionization detector (PID) manufactured by Photovac.
- Methylene chloride, 1,2-dichloroethane (DCA), chloroform, methyl chloroform (TCA), carbon tetrachloride, trichloroethylene (TCE), ethylene dibromide (EDB), and perchloroethylene (PCE) were analyzed on a 6-foot by 0.125-inch column packed with 60/80 mesh 0.1% SP-1000 on Carbopac B and analyzed by gas chromatography using an Electron Capture Detector (ECD).

The gas chromatograph instruments have been modified by the addition of a dryer, composed of ionic polymer materials, situated between the injector and the head of the column. Thus, the sample was injected using a syringe inserted through a septum into the injector, where liquid samples are vaporized. The vapors proceeded through the dryer, where all water vapor from the liquid sample or soil-gas sample was absorbed, and then proceeded through the gas chromatography column to the detector.

#### 4.4 Analysis Methods

The analytical operating procedures used by Tracer Research Corporation (TRC) for testing program included: gas chromatography-photoionization detection (GC-PID); gas chromatography-electron capture detection (GC-ECD); and gas chromatography-themoconductivity detection (GC-TCD).

TRC uses analytical standards from chemical standard from Chem Services, Inc. of Westchester, Pennsylvania that are pre-analyzed for certified purities and lot numbered for quality control assurance. Each vial or gas cylinder is marked with an expiration date. All analytical standards are the highest grade available. Certified purities are typically 99 percent.

The preparation of standards and a description of quality control procedures are given below.

#### Liquid Standards:

- A fresh standard was prepared each day. The standards were made by serial dilution.
  - a. First, a stock solution containing the standard in methanol was prepared at TRC offices in Tucson. The stock solution was prepared by pipetting the pure chemical into 250 ml of methanol in a volumetric flask at room temperature. The absolute mass was determined from the product of volume and density calculated at room temperature. Hamilton microliter syringes, with a manufacturer's stated accuracy of ±1 percent, were used for pipetting. Information on density was obtained from the Chemical Rubber Company (CRC Handbook). Once the stock solution was prepared, typically in concentration range of 50 to 1,000 ppm, a working standard was prepared in water each day. The solute in the stock solution has a

strong affinity to remain in methanol so there was no need to refrigerate the stock solution. Additionally, the solute tends not to biodegrade or volatize out of the stock solution.

- b. The working standards were prepared in 42 ml volatile organic analysis (VOA) septum vials by diluting the appropriate ug/l quantity of the standard solution into 42 ml of water.
- The standard water was analyzed for contamination before making the aqueous standard each day.
- 3. The aqueous standard was prepared in a clean vial using the same syringe each day. The syringe was only used for that standard.
- 4. Final dilutions of the calibration standards were made in water in a VOA vial having a Teflon® coated septum instead of in an evacuated container. The VOA bottle permits mixing of the standard solution and subsequent syringe sampling throughout the day without opening the bottle or exposing it to air. The measurement uncertainty inherent in the use of a VOA bottle instead of a volumetric flask is approximately 1 percent.
- 5. The aqueous standard contained the compounds of interest in the range of 5 to 100 ppb, depending on the detectability of the individual components. The standard was analyzed at least three times at the start of each day to determine the mean response factor (RF) for each component The standard was injected again after every fifth sample to check detector response and chromatographic performance of the instrument throughout the day.

6. The RF allowed conversion of peak areas into concentrations for the contaminants of interest. The RF used was changed if the standard response varied 20 percent. If the standard injections varied by more than 20 percent, the standard was repeated.

If the mean of the two standard injections was greater than a 20 percent difference, a third standard was injected and a new RF was calculated from the three standard injections. A new data sheet was started with the new RFs and calibration date.

Percent relative percent difference =

$$\frac{A \text{ Area - B Area}}{(A \text{ Area + B Area/2})} \times 100$$

Where: A = mean peak area of standard injection from first calibration

B = peak area of subsequent standard injection

- 7. The low ppb aqueous standards that were made fresh daily need not be refrigerated during the day because they do not change significantly in a 24-hour period. Often, the unrefrigerated 24-hour old standards have been compared with fresh standards and no difference has been measurable. If the standards were made at high ppm levels in water, the problem of volatilization would probably be more pronounced in the absence of refrigeration.
- 8. Primary standards were kept in the hotel room when in the field.
- Syringe Blanks
  - Each microliter syringe was blanked before use.

- 2. If ambient air concentrations were <.01 ug/1 for components of interest, a representative sample of at least two syringes of each size (10 cc and 2 cc) were blanked at the start of each day. If representative syringes were "clean" (no detectable contaminants) remaining syringes were not blanked. If any of representative syringes show contamination, all 2 cc and 10 cc syringes were blanked prior to use.
- 3. Syringe blanks were run with nitrogen.
- 4. If it was necessary for any syringe to be used again before cleaning, it was blanked prior to its second use.

#### System Blanks

- System blanks consisted of ambient air drawn through the probe and complete sampling apparatus and analyzed by the same procedure as a soil-gas sample. The probe was above the ground.
- 2. One system blank was run at the start of each day.
- 3. An ambient air sample was collected at the same time and at the same location as the system blank.
- 4. The ambient air sample was also analyzed. A comparison of results did not indicate contamination within the sampling equipment.
- 5. The system blanks were taken at locations away from actual soil-gas sampling locations.

#### Samples

1. All unknown samples were analyzed at least twice, or until reproducibility was within 25 percent, computed as follows:

Relative Difference = 
$$\frac{A - B}{(A + B)/2}$$

Where: A = is first measurement result

B = is second measurement result

If the difference was greater than 0.25, a subsequent sample was run until two measurements were made that had a difference of less than 0.25. Those two measurements were used in the final calculation for that sample.

- 2. The injection volume was adjusted so that the mass of analyte was as near as possible to the mass that is contained in the standard (at least within a factor of 10).
- 3. Whenever possible, the attenuation for unknown samples was kept constant through the day to provide a visual check of integrations.
- 4. A water plug was used as a gas seal in microliter syringes.
- 5. A seal was established between syringes when subsampling.
- 6. All sample analyses were documented (Appendix B).

- 7. Separate data sheet are used if chromatographic conditions changed.
- 8. Everything was labeled in ug/1, mg/1, etc. PPM and PPB notations were avoided.
- Daily System Preparation
  - Integrator parameters were initialized according to the following criteria:
    - a. Point evaluation
    - b. Attenuation
    - c. Peak markers
    - d. Auto zero
    - e. Baseline offset (mininum 10 percent of full scale)
  - 2. The baseline was checked for drift, noise, etc.
  - 3. The following system parameters were set:
    - a. Gas flows (Note:  $N_2$ , air, and He tank pressures).
    - b. Temperatures
      - 1) Injector
      - 2) Column
      - 3) Detector
  - 4. After the last analysis of the day, conditioned septa were rotated into injection ports used during the day and replaced with fresh septa.
  - 5. Column and injector temperatures were increased to bake out residual contamination.

- 6. Syringes were cleaned each day.
  - a. 2 cc and 10 cc syringes were cleaned with Alconox or equivalent detergent and brush.
  - b. Microliter syringes were cleaned daily with IFA or MeOH and purged with  $N_2$ . Syringe Kleen was used to remove metal deposits in the barrel.
  - c. Syringes were baked in the gas chromatograph oven overnight at a minimum temperature of 60°C to drive off organic contaminants which may have absorbed onto the syringe material.

#### 5.0 RESULTS

This section presents the results of testing activities conducted December 2nd through December 15th, 1987 at the McClellan Air Force Base (AFB) for 15 sites (13 landfills and 2 gas monitoring systems associated with Area D cap). Testing was conducted following the procedures described in "McClellan AFB Calderon Investigation Draft Quality Assurance Project Plan (QAPP)" (Radian Corporation, 1987). This project plan was approved by a Sacramento County Air Pollution Control Officer.

The general sampling information provided in Section 5.1 is pertinent to all samples collected. This section provides information on ambient air monitoring, data evaluation, sampling conditions, emissions screening, and land use surrounding the base. Section 5.2 contains site-specific results for all 13 landfill sites sampled. The detailed information provided in this subsection includes a site description, the number of samples analyzed, the results of sampling and daily weather information for the period just prior to and during the field activities.

#### 5.1 General Sampling Information

#### 5.1.1 Ambient Air

Ambient air testing was not performed as part of the landfill testing program for any of the sites. The decision to proceed with subsequent ambient air testing will be based on the interpretation of the landfill gas characterization and gas migration results presented in this document.

#### 5.1.2 Data Interpretation

All analytical data were evaluated on the basis of the limits of detection and quantitation. This evaluation protocol is an accepted practice when sample results are at or near method detection limits. Detection and quantitation limits are defined as follows:

- Limit of Detection (LOD) the minimum concentration of a compound that can be determined to be statistically different from a blank. At a confidence level of 99 percent, the LOD = (average blank concentration) + (3 x standard deviation of blanks). For compounds not detected in any blank, the LOD is assumed to equal the method detection limit or analytical detection limit.
- Limit of Quantitation (LOQ) the concentration of a compound above which quantitative results are obtained with a specified degree of accuracy. For an uncertainty of ± 30 percent and a confidence level of 99 percent, the LOQ = (average blank concentration) + (10 x standard deviation of blanks). For compounds not detected in any blank, the LOQ equals 3.3 times the method detection limit.

The analytical detection limit and the required detection limits are given in Table 5-1. The limits of detection and quantitation are also given in Table 5-1. The raw data used to calculate the limits of detection and quantitation are given in Appendix B. Limits of detection and quantitation for oxygen and nitrogen have not been calculated because these compounds are naturally occurring at concentrations.

The analytical results are presented in Tables 2-1 through 2-15 (condensed analytical results are included in Appendix A; raw analytical data are included in Appendix B). Additional sampling result summaries are presented in this section for each of the investigated sites. The focus of these additional tables is to present the maximum concentration values that exceeded the limit of quantitation and are considered valid results with a high degree of certainty.

#### 5.1.2.1 Quality Assurance

Quality assurance activities associated with the testing program include a multipoint (three point) calibration of the field gas chromatograph



TABLE 5-1. LIMITS OF DETECTION AND QUANTITATION

Required	Required b			Average	Standard				
	Detection	Analytical	ical	Reagent Blank	Deviation	Limit of	t of	Lin	Limit of
	Limits	Detection Limit	n Limit	Concentration	of Blank	Detec	tion	Quent	Quentitetion
Compound	(bpbv)	(ug/1) (pppv)	(ppbv)	(1/gn)	Concentrations	(1/ <b>6</b> n)	(ppbv)	(1/Bn)	(bppv)
Vinyl Chloride	200	0.050	17.9	0/W	٧/٣	0.050	17.9	0.165	59.1
Benzene	200	0.045	12.9	0/N	N/A	0.045	12.9	0.149	45.6
Ethylene Dibromide	-	0.001	0.119	Q/N	N/A	0.001	0.119	0.003	0.393
Ethylene Dichoride	50	90.0	18.1	Q/M	N/A	0.08	18.1	997.0	29.7
Methylene Chloride	09	0.089	23.5	M/D	M/A	0.089	23.5	0.294	77.6
Perchloroethylene	10	0.001	0.135	0/M	N/N	0.001	0.135	0.003	977.0
Carbon Tetrachloride	<b>5</b>	0.0002	0.029	M/D	H/A	0.0002	0.029	0.001	0.096
Methyl Chloroform	10	0.001	0.168	0/N	N/A	0.001	0.168	0.003	0.554
Trichloroethylene	10	0.001	0.17	0/H	N/A	0.001	0.17	0.003	0.561
Chloroform ,	2	0.005	0.376	Q/N	N/N	0.005	0.376	0.007	1.24
Methane (X)	S/N	0.29	<b>4/</b> *	M/D	N/A	0.29	N/A	96.0	<b>*</b>
Carbon Dioxide (X)	N/S	79.0	W/A	0/N	N/A	79.0	<b>4/</b>	2.2	N/A
Oxygen (X)	SS 22	<del>5.</del>	<b>*</b>	8/8	<b>**</b>	<b>.</b> €:	4/R	W. W.	V 2
Mitrogen (%)							<b>4</b>		۲/E

Limits were calculated based on analytical detection limits.

These method detection limits are required by Attachment 2 of the <u>Mazardous Waste Disposal Site Testing Guidelines</u>, ARB, 1987.

C Analytical detection limit is equivalent to the method detection limit.

The limit of detection is defined as the minimum concentrations that can be determined to be statistically different from a blank. for compounds not detected in any blank, the LOD equals the analytical detection limit.

The limit of quantitation is defined as the concentration above which quantitative results are obtained with a specified degree of confidence. For compounds not detected in any blank, the LOQ equals 3.3 times the analytical detection limit.

Units are percent (X).

N/A = Not applicable.

N/D = Not detected in any blank.

N/S = Not specified.

NOTE: Compliance with the required detection limits is demonstrated by comparison of the required detection limits to the analytical detection limits.

(GC) daily response factor checks, daily system (probe) and air blanks, each sample analyzed in duplicate, and duplicate sampling and analysis using duplicate probes. The results of these activities for the period of December 2 through December 15, 1987 are presented in Appendix B and discussed below.

Prior to initiating field sampling and analysis, a three-point calibration of the field GC was performed for all 14 test species, except vinyl chloride. The correlation coefficient for the multipoint calibration ranged from 0.949 to 0.999 for nitrogen. The average correlation coefficient was 0.993, which was slightly below the target correlation coefficient of 0.994. Twelve of the 14 compounds had correlation coefficients greater than 0.995. A summary of the instrument, detector and column, and the multipoint calibration information, provided by the Tracer Research Corporation, is presented in Appendix F.

A single-point calibration was performed daily to determine the daily average response factor for each compound. This single-point check was repeated after ten samples to determine instrument drift. All 14 compounds were within the acceptance criteria of  $\pm$  20 percent change in response factor. All single-point calibration data are considered acceptable.

Daily system blank checks (through the probe) and air blank samples were performed to determine if probe contamination existed. The system blank concentrations were equivalent to the air blank concentration except for trichloroethylene. For trichlorethylene, the system blank concentrations were one order of magnitude higher than the air blank.

The reagent blank data were used to determine the limits of detection and quantitation for the individual compounds as discussed in Section 5.2. The calculated limits of detection and quantitation were less than or equal required detection limits for all compounds listed in the "Hazardous Waste Disposal Site Testing Guideline," ARB, 1987. These results indicate that the sampling and analysis methodologies were sufficient to meet the testing program objectives.

Duplicate samples were collected using a separate sampling probe, one foot apart from the original sampling point. Six of the 14 components were detected in both samples. The recommended acceptance criteria for the precision of a field activity is a coefficient of variation (CV) of  $\leq$ 50 percent. This allows for any sampling variability. The CVs for the duplicate sample ranged from 0 to 47 percent, meeting the recommended acceptance criteria.

A daily checklist was completed by the field technician. The list was prepared at the end of the day as a final check to ensure all the Quality Control (QC) checks had been performed by the field personnel.

#### 5.1.3 <u>Sampling Conditions</u>

The "Hazardous Waste Disposal Site Testing Guidelines" identify specific and minimum sampling conditions for collecting surface landfill, and perimeter gas samples (California Air Resources Board, 1987). Precipitation and temperature are both important factors in assessing the usefulness of the sample results. Table 5-2 summarizes the temperature and precipitation data collected by the McClellan AFB, Detachment 8, 17th Weather Squadron for the months of November and December 1987.

The weather conditions summarized in Table 5-2 indicate rain periods throughout the sampling program (December 4th through 15th). The only sampling events that had no rain 72 hours prior to sampling occurred on December 14th and 15th. Hand augers were used whenever possible to determine how deep, the zone of water saturation extended. In almost all cases the zone extended no more than three feet. Discussions of the hand augering performed on each day of sampling can be found in Section 5.2.

#### 5.1.4 Gas Characterization

Landfill gas characterization consisted of an emissions screening survey and landfill gas testing. An emissions screening survey of each

TABLE 5-2. WEATHER CONDITIONS FOR McCLELLAN AFBa

Date	Number of Samples Collected	Precipitation (inches)	Peak Wind (knots)	Temperature Range (°F)	Mean Temperature (°F)
NOVEMBER	<del> </del>				<del></del>
20	••	0.31	14	<b>57 - 50</b>	54
21	••	0.01	7	57 - 48	53
22	••	0	2	55 - 39	47
23		0	6	5 - 37	46
24		0	12	60 - 44	52
25		0	0	61 - 42	52
26	• •	0	0	<b>59 - 3</b> 5	47
27	• •	0.02	0	58 - 34	46
28		0	0	59 - 40	50
29	• •	0	0	57 - 43	50
30		1.27	0	53 - 47	50
DECEMBER					
1	• •	0.35	0	60 - 49	55
2	2P	0.06	Ö	65 - 56	61
3	1P	0	10	67 - 56	62
4	6P	0.33	12	60 - 51	56
5	9P	0.01	0	58 - 53	56
6	• •	0.54	Ö	59 - 52	56
7	5V/9P	0	Ö	59 - 48	54
8	17	0.49	Ō	54 - 39	47
9	5V/7P	0.1	0	60 - 52	56
10	10P	Trace	0	65 - 52	59
11	13P/1V	0	0	58 - 44	51
12	• •	0	0	56 - 41	49
13		0	0	53 - 36	45
14	6P/4V	0	0	48 - 35	42
15	2P/7V	0.05	0	53 - 38	46
16	• •	1.12	0	51 - 44	48
17		0	7	57 - 37	47
18	••	0.02	6	53 - 38	46
19	••	0.01	8	58 - 42	50
20		0	8	48 - 37	43
21	• •	0.07	6	52 - 42	47
22	• •	0.18	16	54 - 43	49

SOURCE: McClellan AFB, Detachment 8, 17th Weather Squadron.

Data obtained from on-base monitoring. 1987.

P - Probe

V - Vapor well

<sup>-- -</sup> No samples collected.

landfill was performed on November 23, 1987. During the survey, a technician walked over each disposal site surface with a portable flame ionization detector. The detector used was a Foxboro Corporation Model OVA-108 Organic Vapor Analyzer, which has a calibrated range of 1 to 10,000 parts per million volume (ppmv) total hydrocarbons (calibrated as methane in air). The technician measured for landfill gas by holding the instrument probe within three inches of the landfill surface while walking a grid pattern over the entire site. The technician measured background levels before and after the survey by standing at the upwind end of the disposal site, holding the detector probe ten feet above the ground, and noting the reading after one minute.

The background level measured before and after the emissions screening survey was equal to or less than 3.5 ppm. During the emissions screening survey, no levels exceeding the background level were measured. No readings above the 50 ppm methane criteria were observed. The emissions screening included measurements across each landfill and along the perimeter of the landfill. In some cases only the perimeter was accessible due to physical barriers such as buildings or stored construction materials. The path traveled for each landfill during this screening is presented in Appendix C. The path traveled for Area D is presented in Figure 5-17. Meteorological observations during the survey were: 3-4 mph wind, no rain, and temperatures ranging from 47 to 70°F (see Table 5-2). The emission screening data sheet and instrument calibration sheet are also included as Appendix C.

#### 5.1.4.1 Analytical Results and Field Identification Numbering System

The following numbering system has been established for identifying the sample results of the field testing. Two corresponding sets of numbers have been identified for each set of soil-gas analytical results. The analytical results numbering system is used to identify the locations of the landfill and gas migration samples in each of the site maps and in the analytical results summaries. The analytical results identification (ID) numbering system is a two-number sequence. The first number corresponds to the site number and is followed by a number in parenthesis identifying a

unique sample location. For example, the sample number 12(2) identifies the sample location "(2)" for Site 12. The field ID numbering system is footnoted in the data summaries in Section 2.0. The raw data is presented in Appendices A and B and were generated by Tracer Research Inc., a subcontractor to Radian Corporation.

The field ID number is an alpha numeric designation, beginning with a two digit alpha code (i.e., SG for soil gas, VW for vapor well, and VC for vent cap) describing the type of sample source. This alpha code is followed by a three digit alpha numeric code which identifies the site number and whether it is a landfill gas probe location (designated L) or a gas migration perimeter probe (designated by a P). For example, a landfill probe for Site 15 would be designated as SG-15L. The analytical results summaries presented in Section 2.0 provide footnotes that identify the analytical results II number and the corresponding field ID number for ease in reviewing the raw data tables in the appendices.

### 5.2 Individual Landfill, Vent Cap and Vapor Well Sample Results

This section contains detailed information about the 65 soil-gas probe samples and the 23 vapor well samples collected. Information included in each subsection includes site location, site description, number of samples taken, sample depths, soil gas characterization, daily precipitation data, and hand augering information. Figures 5-1 through 5-17 contain area maps and sample locations.

Soil probe samples were driven as close to the 6-foot (perimeter) or 8-foot (landfill) goal as possible; however, two conditions necessitated a shallower sample depth. The first is refusal of the probe by the underlying ground formations or site debris (a second attempt was made before a sample was taken). The second reason for a shallower sample depth was poor soil-gas migration indicated by a high vacuum at the vacuum pump. The probe was pulled up until the vacuum fell below the maximum 23 pounds per square inch (psi) to approximately 17 psi. The drop in the vacuum indicated a soil-gas flow



through the sampling probe; however, sometimes this vacuum reading would not drop until the probe had been pulled up one or more feet past the six- or eight-foot depth. The high vacuum conditions were caused by the tightly packed nature of the clay soils and in some instances, the presence of saturated conditions.

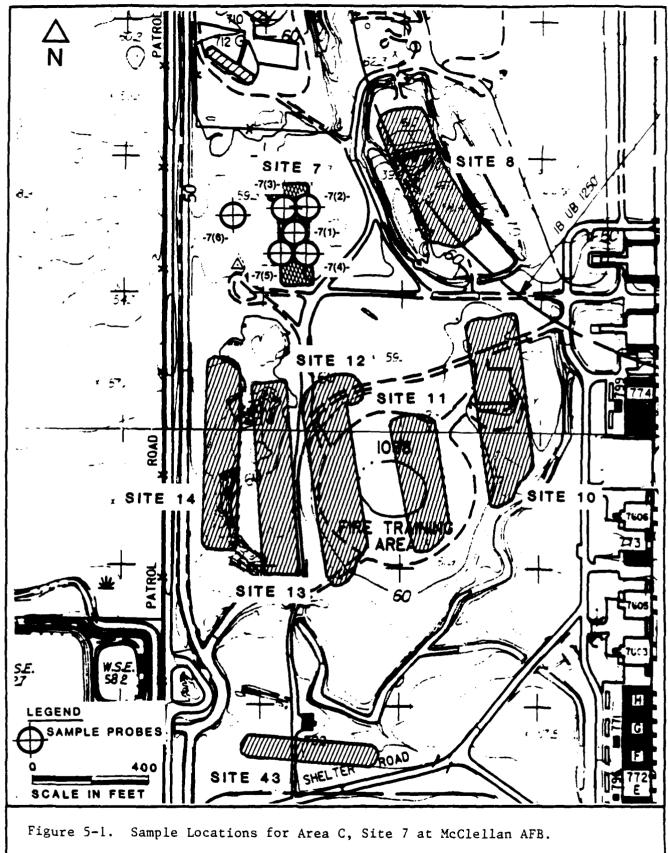
Landfill gas samples were all analyzed for methane, fixed gases (carbon dioxide, nitrogen, and oxygen), and the 10 specified air contaminant compounds listed in Table 1-1. Perimeter probes were also included in this full spectrum analysis, even though California Air Resources Board (ARB) guidelines allow for methane only to be sampled if the landfill samples have no detectable amounts of the compounds listed in Table 1-1. This more conservative approach was used in the event that a perimeter sample was located over a landfill, and to provide more complete information about any off-site soil-gas migration.

The analytical results for the probe, gas vent, and vapor well are presented in Tables 2-1 through 2-17. The quality control measures used for the project are described in Subsection 5.1.

#### 5.2.1 Landfill Gas Testing Results for Site 7

Site 7 is located on the west side of the base, east of Building 701. The site is flat, except for a small mound of rubble in the center, and is covered with native vegetation. The site was previously used as a sludge and oil pit and measured approximately 380 feet by 93 feet by 23 feet deep. Samples of the waste showed low concentrations of a variety of VOCs, base/neutral and acid extractable compounds. One PCB was detected in one sample. Elevated concentrations of phenanthrene and Aroclor 1254 in composite waste samples were detected.

The landfill and gas migration testing locations for Site 7 are presented in Figure 5-1.



#### 5.2.1.1 <u>Samples</u>

A total of six probes samples were taken at Site 7; five in the area of the landfill and one in the western perimeter.

As shown in Figure 5-1, the Site 7 samples are labeled 7(1) through 7(6). Probe depths ranged from two to eight feet; the two foot sample was from the perimeter probe and due to probe refusal. The cause for this probe refusal is thought to be a layer of shallow sandstone which the probes are unable to penetrate. Other sites in the area had similar problems at similar depths. This layer of sandstone was noted at Site 43.

Landfill and perimeter probe samples for Site 7 were all collected on December 4th and 5th. Rainfall had occurred in the 72 hours prior to December 4th and December 5th, and it rained both sampling days. Approximately 0.33 inches of precipitation occurred on the 4th, and a lighter precipitation of 0.01 inches fell on the 5th. The cumulative rainfall for the preceding 72 hours to December 4th was 0.41 inches, the cumulative rainfall for the preceding 72 hours to December 5th was 0.34 inches. In accordance with the sampling protocol for conditions where rainfall occurred during sampling or 72 hours prior to sampling, hand augers were used to bore and collect soil samples for inspection of soil moisture in the sampling areas on December 4th and 5th at Site 7; dry soil was found at 3 and 2 feet, respectively.

The analytical results for both gas characterization sampling, using landfill probes, and off-site gas migration sampling, using perimeter probes, are given in Table 2-1. Table 5-3 further summarizes the Table 2-1 results. Table 5-3 presents the maximum concentration value detected above the limit of quantitation (LOQ) for the specified air contaminants listed in Table 1-1. All other air contaminants tested below the limit of quantitation. It should be noted that the Site 7 perimeter sample is also part of a series of perimeter sample locations surrounding a cluster of seven sites. Sixteen perimeter samples were located to detect off-site gas migration at Sites 7, 8, 10, 11,



TABLE 5-3. SUMMARIZED ANALYTICAL RESULTS OF SITE NO. 7 LANDFILL GENERATION AND OFF-SITE GAS MIGRATION<sup>a</sup>

	Landfill	Landfill	Pe	Perimeter
Compound	Number of Probes Above Average LOO	Highest Concentration (ppbv)	Number of Probes Above Average LOQ	Highest Concentration [ppbv]
Virvi Chloride	S	2,000	0	0
Boozens	ं स्न	<2,000 <sup>d</sup>	0	0
Delizene Ethylana Dibromida	· au	, (5 <sup>d</sup>	0	0
Ethylene Dichloride	<del>-</del>	<200 <sub>q</sub>	0	0
Methylene Chloride	. 4	000"6	<b>~</b>	100
Derchlorethylene	· kū	300	0	0
Carbon Tetrachloride	ı Qu	98°0>	0	0
Methyl Chloroform	1 10	100	0	0
Trichloroethylene	ເນ	400	-	<b>-</b>
Chloroform	თ	4	0	0

a Five landfill probes and one perimeter probe were sampled at this site. All analytical results are presented in Table 2-1, including the sampling depths for the landfill and perimeter probes.

b LOQ = Limit of quantitation.

 $<sup>^{</sup>m c}$   $_{
m ppbv}$  = Parts per billion volume; original field data in units of ug/L.

d This value represents the highest daily analytical detection limit (method detection limit); no quantitate data were avail-

12, 13, and 14 as shown in Figure 5-2. It was felt that a greater number of perimeter probes around these sites could offset an inability to install landfill probes and still provide useful information for these three sites.

### 5.2.2 Landfill Gas Testing Results for Site 8

Site 8 is located on the west side of the base, 280 feet east of Site 7 and 700 feet northwest of Building 774. The site area is approximately 435 feet by 135 feet by 20 feet deep, and was previously a sludge and refuse Site 8 is covered by natural vegetation and some construction debris. A significant feature of this site is the large berm that encompasses the site, making some perimeter areas inaccessible. Historical soil samples of the waste showed very few VOCs, including benzene, toluene, trans-1,2dichloroethylene, and acetone, up to 10 base/neutral compounds of which chrysene, phenanthrene, 3,4-benzofluoroanthene (560 ug/kg), dibenzo(a,h) anthracene (1,500 ug/kg), and indeno(1,2,3-cd)pyrene (1,200 ug/kg) were detected in elevated levels. No acid extractable compounds or pesticides and PCBs were detected. Elevated concentrations of oil and grease (300-6,170 ug/kg) and three heavy metals also were detected. All heavy metal concentrations were below total threshold limit concentration (TTLC) values, as established by the California Department of Health Services (DOHS). Currently, the bermed area appears to be used as a military training ground.

An area map of Site 8, along with the sample probe locations, is presented in Figure 5-3.

A total of eight probe samples were taken at Site 8; five in the area of the landfill and three around the perimeter. As shown in Figure 5-3 the samples are labeled 8(1) through 8(8). Probe depths ranged from 4 to 8 feet; the eight-foot target depths were achieved on four of the probes as Table 2-2 indicates.

Landfill and perimeter probe samples for Site 8 were all collected on December 10th and 11th. Rainfall had occurred in the 72 hours prior to

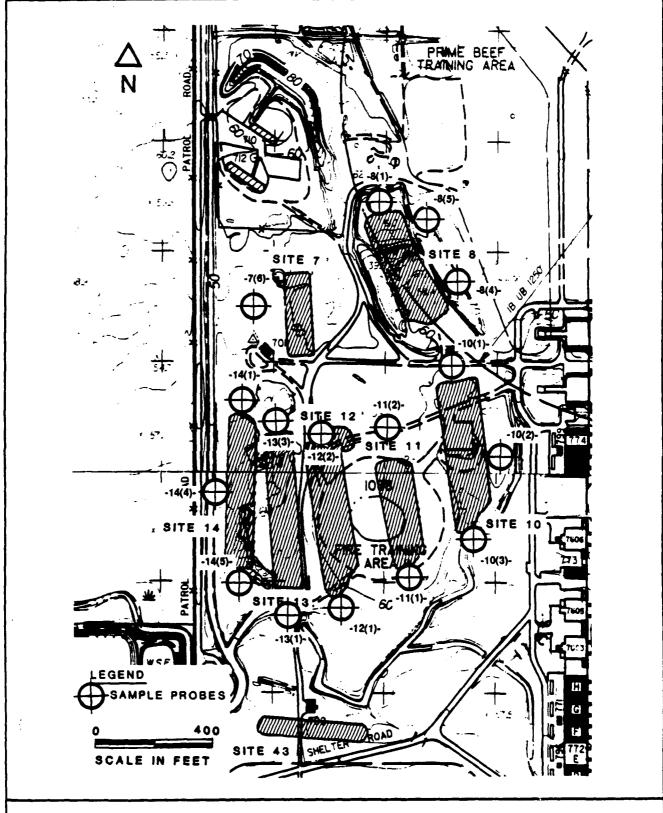


Figure 5-2. Sample Locations for Area C, Sites 7, 8, 10, 11, 12, 13, and 14 at McClellan AFB.

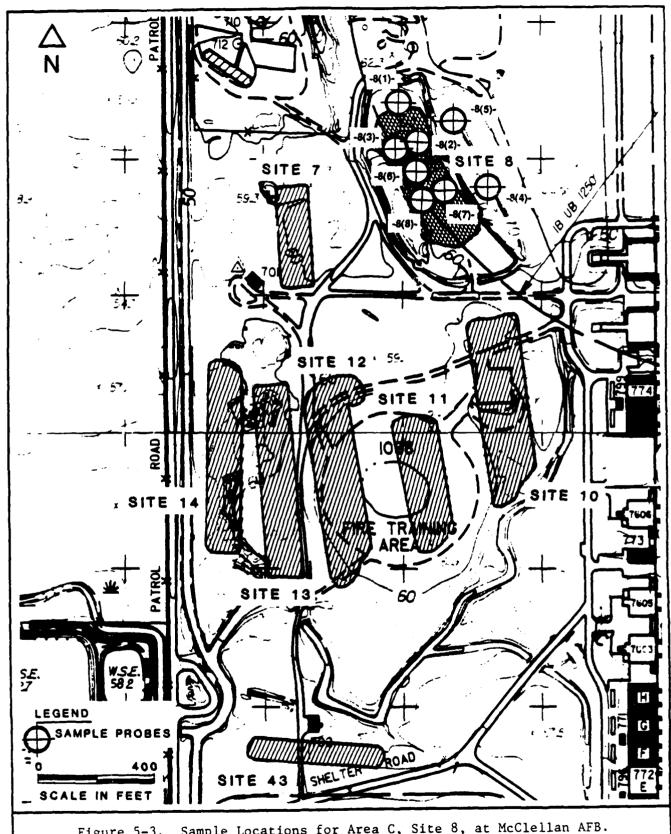


Figure 5-3. Sample Locations for Area C, Site 8, at McClellan AFB.

sampling, and trace rainfall occurred on December 10. Approximately 0.50 inches of precipitation occurred in the 72 hours prior to December 10, and 0.50 inches of precipitation had occurred prior to December 11. A hand auger sample was taken in Site 8 on December 7th prior to sampling and showed dry soil at 2.5 feet; and a hand auger on December 10th in Site 8 also showed dry soil at 3 feet. Since only trace rainfall occurred on December 11th, no repeat augering was performed on that day.

The analytical results for both gas characterization sampling, using landfill probes, and off-site gas migration sampling, using perimeter probes are given in Table 2-2. Table 5-4 further summarizes the Table 2-2 results. Table 5-4 presents the maximum concentration value detected above the limit of quantitation (LOQ) for the specified air contaminants listed in Table 1-1. All other tested air contaminants were below the limit of quantitation.

### 5.2.3 Landfill Gas Testing Results for Sites 10, 11, and 12

Sites 10, 11, and 12 are located near Site 7 and 8. These three sites are very close together and were studied as a group rather than discrete sites. Because the sites are close together, attempts to distinguish between them for this field investigation proved to be difficult or impossible.

Site 10 is located about 140 feet south of Site 8 on the west side of the base and is 500 feet west of Building 774 (see Figure 5-4). The site area is approximately 530 feet by 100 feet by 15 feet deep and was used as a solid waste landfill. It is covered by natural vegetation and some construc-Historical soil samples collected from the area by McLaren tion refuse. Engineering contained a variety of compounds including 8 VOCs, 15 base/neutral compounds, 2 acid extractable compounds, 2 non-priority compounds, and one PCB. Elevated concentrations of chloroform (41-890 ug/kg), acenaphthene (140 ug/kg), anthracene (110 ug/kg), chrysene (400 ug/kg), fluorene (230 ug/kg), naphthalene (210 ug/kg), phenanthrene (500 ug/kg), pyrene (930 ug/kg) and Aroclor 1260 (PCB 1260) (1,490-150,000 ug/kg) were detected. samples also showed a variety of heavy metals. Total concentrations of cadmium, copper, lead, and zinc were above DHS TTLC values. Soluble concentrations of antimony, cadmium, copper, lead, and zinc were detected at Rev. 02/17/88 5-16

Rev. 02/1//88 Calderon (SWAT)



TABLE 5-4. SUMMARIZED ANALYTICAL RESULTS OF SITE NO. 8 LANDFILL GENERATION AND OFF-SITE GAS MIGRATION<sup>®</sup>

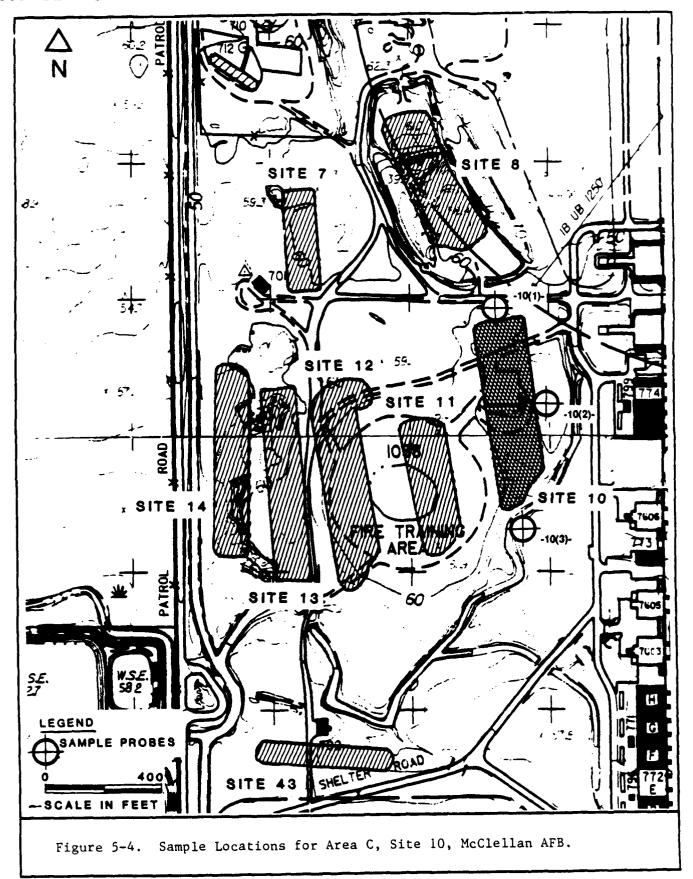
Number of Compound Above Ave Vinyl Chloride 2 Benzene 1 Ethylene Dibromide 2	o dono			
Vinyl Chloride Benzene Ethylene Dibromide	Above Average LOG	Highest Concentration (ppbv)	Number of Probes Above Average LOO	Highest Concentration (ppbv)
Benzene Ethylene Dibromide	a	120,000	0	0
Ethylene Dibromide	1 ~	2.000	-	200
	- <b>Q</b> I	44	-	<b>9</b> 6,
Ethylene Dichloride	-	008>	-	,500d>
Methylene Chloride 2	8	006>	-	<300
Perchloroethylene 5	5	7,000,7	6	200
Carbon Tetrachlorida 2	2	8.0>	-	<0.5
Methyl Chloroform 5	co.	10,000	Ø	20
Trichtoraethylene 5	5	F008	ဇ	50
Chloroform	ત્ય	<b>,</b> 89	-	< <b>4</b> "

All analytical results are presented in Table Five landfill probes and three parimeter probes were sampled at this site. 2-2, including the sampling depths for the landfill and perimeter probes.

L00 = Limit of quantitation.

ppbv = Parts per billion volume; original fiald data in units of ug/L.

d This value represents the highest daily analytical detection limit (method detection limit); no quantitate data were avail-



concentrations above soluble threshold limit concentration (STLC) values, as established by DHS. Currently, a portion of Site 10 is being used as a secured storage area for low level contaminanted soils.

Site 11 is located 90 feet west of Site 10 and 600 feet west of Building 774 (see Figure 5-5). The site area is 405 feet by 80 feet by 6 feet deep, and was previously used as a solid waste landfill. Currently, a large portion of this site is being used as a secured storage area for low-level contaminated soils. Historical soil samples collected from the area by McClaren Engineering contained low concentrations of VOCs, and a variety of acid extractable compounds, PCBs, base/neutral extractable compounds, and metals. VOCs detected included chloroform (53-140 ug/kg), chlorobenzene (190-380 ug/kg), and dichloromethane (260 ug/kg). Elevated concentrations of phenanthene (370 ug/kg), fluorene (240 ug/kg), and pyrene (240 ug/kg) were detected. Oil and grease (220-6,430 mg/kg) and phenolic compounds were detected. Concentrations of total lead were above TTLC values. Concentrations of soluble lead were above STLC values. Concentrations of total and soluble chromium were above TTLC and STLC values for chromium VI but below TTLC and STLC values for chromium VI but below

Site 12 is located 90 feet west of Site 11 and 900 feet southwest of Building 774 (see Figure 5-6). The site area is 610 feet by 90 feet by 12 feet deep, and was previously used as a solid waste landfill. A large portion of Site 12 is also being used as a secured storage area for low-level contaminated soil. Historical site samples collected from the area by McLaren contained a variety of VOC and non-VOC compounds and heavy metals. Dichloromethane (methylene chloride) (200-210 ug/kg) was detected in and immediately below the waste at elevated concentrations. The waste samples also showed anthracene (5,900 ug/kg), benzo(a)anthracene (13,000 ug/kg), chrysene (12,000 ug/kg), fluoranthene (28,000 ug/kg), and fluorene (5,400 ug/kg) at elevated concentrations. Soluble lead was above STLC values. Analyses of soil samples from around the pit indicated little lateral migration from the pit, except possibly to the east where moderate levels of VOCs were detected. The compound 1,1-dichloroethylene (2,200 ug/kg) was detected in a boring to the east

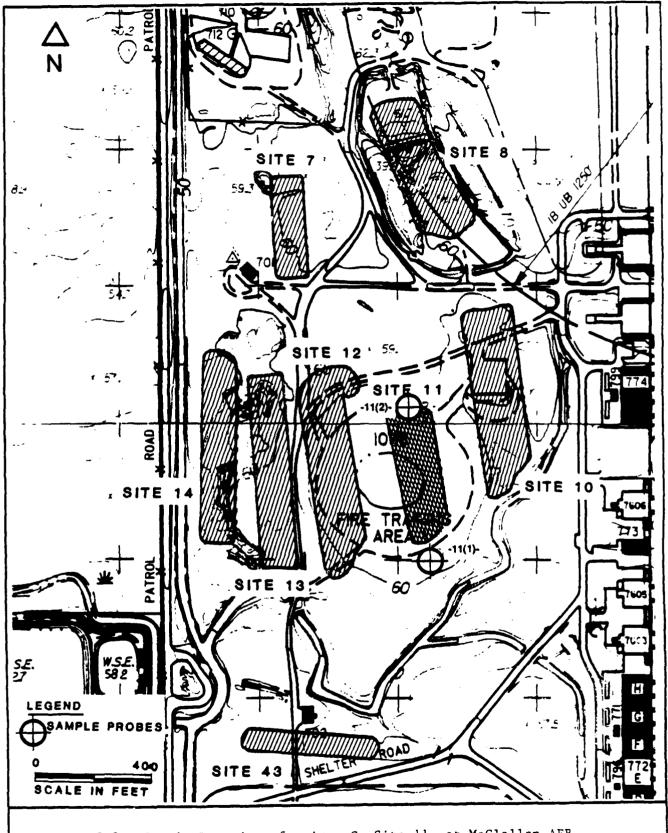
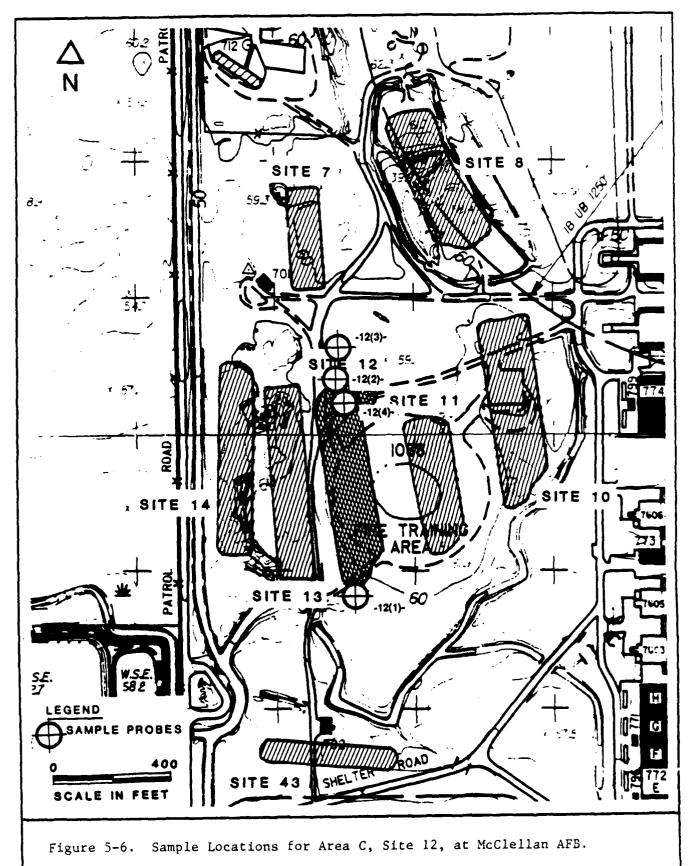


Figure 5-5. Sample Locations for Area C, Site 11, at McClellan AFB.



of the pit at elevated concentrations but was not detected in the waste. The soil sample borings indicated that the extent of the buried waste was wider than shown in the 1968 photograph. The actual width was approximately 90 feet.

Area maps for these three sites along with sample locations can be found in Figures 5-4 through 5-6. As Figures 5-4 through 5-6 show, Sites 10, 11, and 12 consisted of perimeter probe samples only. Landfill samples were not collected because of access problems to the landfill areas. Portions of each of these sites are being used as a secured storage area for low-level contaminated soils. A total of nine perimeter probe samples were placed around the site; two extra probes were placed at the north end of Site 12 since the probe 12(2) showed elevated levels of vinyl chloride and benzene. The probe samples are labeled 10(1) through 10(3) 11(1) and 11(2); and 12(1) through 12(4).

Perimeter probe depths ranged from 2 to 6 feet. Shallow probe depths resulted when the probes encountered a sandstone formation. This sandstone formation was also encountered during probe installation at nearby sites.

Probe samples for these three sites were collected on December 5, 7, and 15. Rainfall occurred within a 72-hour period prior to sampling on December 5 and December 7. Rainfall occurred on December 15. A light precipitation of 0.01 inches occurred on December 5 and a cumulative 0.39 inches of rainfall occurred in the 72 hours prior to December 5. Approximately 0.88 inches of precipitation had occurred in a 72-hour period prior to December 7. Approximately 0.05 inches of rainfall was recorded on December 15. No rainfall had occurred in the previous 72 hours to December 15. Hand augers were used to bore and collect soil samples which were inspected to determine the soil moisture conditions at depth in the sampling areas. Hand auger samples were collected on December 5 at Site 7. Dry soil was noted at a 2-foot depth. Hand auger samples were also taken on December 7 between Sites 11 and 12. Dry soil was noted at a 3-foot depth.

The analytical results for both gas characterization sampling, using landfill probes, and off-site gas migration sampling, using perimeter probes, for Sites 10, 11, and 12 are given in Tables 2-3, 2-4, and 2-5. Tables 5-5, 5-6 and 5-7 further summarize the Table 2-4 through 2-6 results. Tables 5-5 through 5-7 each presents the maximum concentration value detected above the limit of quantitation (LOQ) for the specified air contaminants listed in Table 1-1 for Sites 10, 11, and 12, respectively. All other tested air contaminants were below the limit of quantitation.

### 5.2.4 Landfill Gas Testing Results For Sites 13 and 14

Site 13 is located 20 feet west of Site 12 and 1,000 feet west of Building 774 (see Figure 5-7). The site area is 600 feet by 90 feet by 15 feet deep, and was previously used as a solid waste landfill. divided by an asphalt road that leads to Sites 7 and 9. samples collected from the area by McLaren contained metal pieces, wood, burlap, plastic, paper, and carbonaceous (burned) material. Releases of an unknown gas were observed while drilling the cased borings. The first cased boring was terminated. The gas from the second cased boring was sampled twice, and analyses showed the gas was predominantly methane. analyses of the waste showed low to high concentrations of VOCs, including acetone and 2-butanone above 40,000 ug/kg. Dichloromethane (27-96 ug/kg) was also detected. These samples also showed a variety of base/neutral and acid extractable, non-priority, pesticide, and PCB compounds. Elevated concentrations of acenaphthene (100 ug/kg), chrysene (170 ug/kg), phenanthrene (190 ug/kg), pyrene (150 ug/kg), n-nitrosodiphenylamine (220 ug/kg), chlordane (720 ug/kg), and PCB 1260 (1,000-1,800 ug/kg) were detected.

Site 14 is located 90 feet west of Site 13, adjacent to Patrol Road and south of Building 701 (see Figure 5-8). The site area is approximately 600 feet by 90 feet by 14 feet deep, and was previously used as a solid waste landfill. Site 14 is covered by grass and natural vegetation; a large, 15-foot high mound of soil covers the length of the site. Historical soil samples collected from the area by McLaren contained buried burn debris



TABLE 5-5. SUMMARIZED ANALYTICAL RESULTS OF SITE NO. 10 LANDFILL GENERATION AND OFF-SITE GAS MIGRATION

	Lei	Landfill	Per	Perimeter
Compound	Number of Probes Above Average LOO	Highest Concentration {ppbv}	Number of Probes Above Average LOQ	Highest Concentration (ppbv)
Carbon Tetrachloride	ס	P	•	0.1
				730-15-14-15-04-16-16-16-16-16-16-16-16-16-16-16-16-16-

a One landfill probe and three perimeter probes were sampled at this site. All analytical results are presented in Table 2-3 including the sampling depths for the landfill and perimeter probes.

b = Limit of quantitation.

 $^{
m c}$  ppbv = Parts per billion volume; original field data in units of ug/L.

d Site conditions prohibited collection of samples.



SUMMARIZED ANALYTICAL RESULTS OF SITE NO, 11 LANDFILL GENERATION AND OFF-SITE GAS MIGRATION<sup>B</sup> TABLE 5-6.

	Lan	Landfill	Po	Perimeter
Compound	Number of Probes Above Average LOO	Highest Concentration (ppbv)	Number of Probes Above Average LOO	Highest Concentration (ppbv)
Perchloroethylene	פ	Ū	<b>e</b> -	တ
Methylene Chloroform	Q	פ	-	9.0
Trichloroethylene	ס	Ð	τ-	4

a No landfili probes and two perimeter probes ware sampled at this site. All analytical results are presented in Table 2-4, including the sampling depths for the landfill and perimeter probes.

b = Limit of quantitation.

 $^{
m C}$  ppbv = Parts per billion volume; original field data in units of ug/L,

Site conditions prohibited collection of samples.



SUMMARIZED ANALYTICAL RESULTS OF SITE NO. 12 LANDFILL GENERATION AND OFF-SITE GAS MIGRATION<sup>®</sup> TABLE 5-7.

	Lan	Landfill	Pe	Perimeter
Compound	Number of Probes Above Average LOO	Highest Concentration (ppbv)	Number of Probes Above Averege LOQ	Highest Concentration (ppbv)
Vir . Chloride	70	ъ	Ø	26,000
Benzene	D	70	4	32,000
Ethylene Dibromide	ס	ס	ຜ	<b>44</b>
Ethylene Dichloride	D	ס	8	<500
<b>Methylene Chloride</b>	D	ס	m	1,000
Perchlaroethylene	ס	ס	4	4,000
Carbon Tetrachloride	σ	70	ઢા	09
Methyl Chloroform	TO	ס	4	08
Trichloroethylene	ס	70	4	8,000
Chloroform	P	P	Q	2,000

All analytical results are presented in Table 2-5, a No landfill probes and four perimeter probes were sampled at this site. including the sampling depths for the landfill and parimeter probes.

LOO = Limit of quantitation.

c ppbv = Parts per billion volume; original field data in units of ug/L.

Site conditions prohibited collection of samples.

e This value represents the highest daily analytical detection limit [method detection limit]; no quantitate data were available.

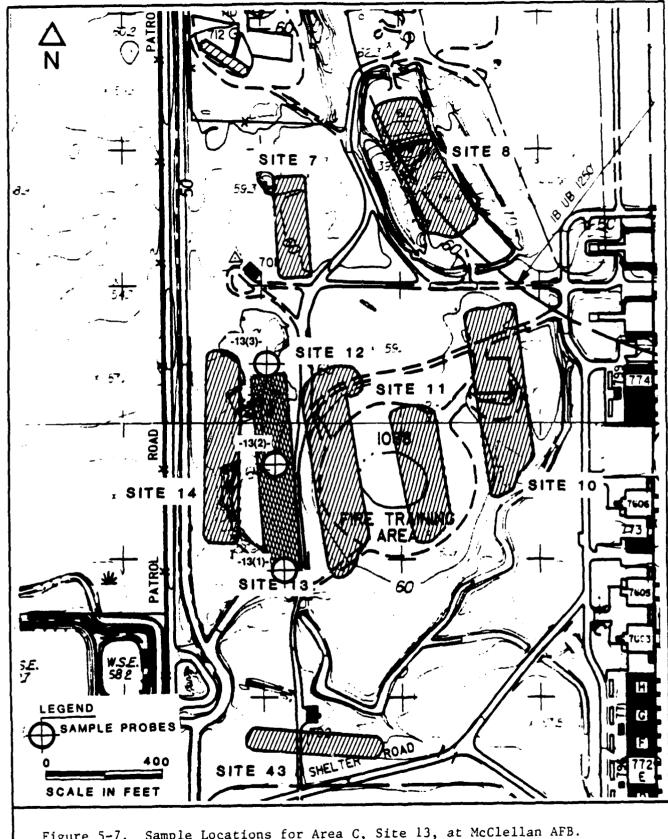
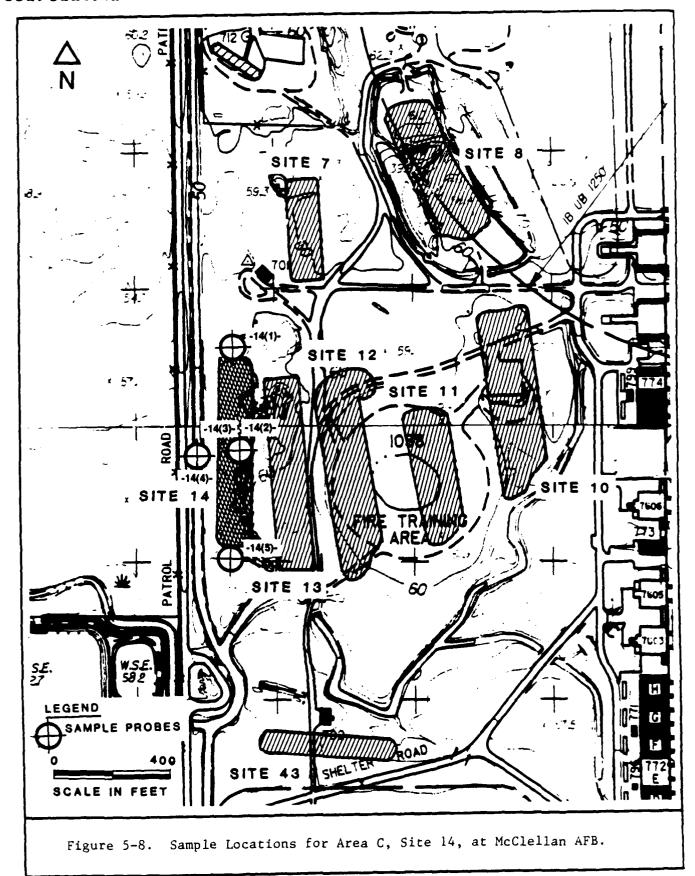


Figure 5-7. Sample Locations for Area C, Site 13, at McClellan AFB.



5-28

consisting of metal, glass, wood, cloth, paper, and vegetative debris. Composite analyses of the waste showed low concentrations of VOCs and a variety of non-VOC compounds. VOCs detected included dichloromethane (48-140 ug/kg), toluene (22-43 ug/kg), and chlorobenzene (13-46 ug/kg). Elevated concentrations of acenaphthene (210 ug/kg), anthracene (150 ug/kg), fluorene (300 ug/kg), phenanthrene (1,300 ug/kg), and pyrene (240 ug/kg) were detected. A concentration of total mercury was above TTLC values, and concentrations of soluble cadmiumand soluble lead were above STLC values.

Sites 13 and 14 had a total of 8 soil gas probe samples collected. Three were located in the landfill area and five at the perimeter. The samples are designated as 13(1) through 13(3) and 14(1) through 14(5), an extra landfill sample was taken in an attempt to reach the target sampling depth of 8 feet. Sample depths ranged from 5 to 8 feet; three of the eight samples reached the target sampling depths. The landfill and perimeter probe samples were collected on December 2, 3, and 4 for these sites.

Rainfall occurred on two of the three sampling days. Rainfall had occurred 72 hours prior to each of the sampling days. Approximately 0.06 inches of precipitation occurred on December 2. In the 72 hours prior to December 2, 1.7 inches of rain occurred. No rain fell on December 3, but approximately 1.7 inches of rain had fallen within the previous 72 hours. Approximately 0.33 inches of rain fell on December 4. In the 72 hours prior to December 4, 0.41 inches of rain had occurred.

Hand augers were used to bore and collect soil samples which were inspected to determine the soil moisture conditions at depth in the sampling areas. Hand auger samples were collected on December 4 at Sites 13 and 14. Dry soil was noted at a depth of 2 feet in Site 13 and at a depth of 1.5 feet in Site 14.

The analytical results for Sites 13 and 14 for gas characterization sampling, using landfill probes, and off-site gas migration sampling, using perimeter probes, are given in Table 2-6 and 2-7. Tables 5-8 and 5-9 further



SUMMARIZED ANALYTICAL RESULTS OF SITE NO. 13 LANDFILL GENERATION AND OFF-SITE GAS MIGRATION<sup>8</sup> TABLE 5-8.

	Lan	Landfill	Pe	Perimeter
Compound	Number of Probes Above Average LOG	Highest Concentration (ppbv)	Number of Probes Above Average LOO	Highest Concentration (ppbv)
Vinvl Chloride	0	0	-	2,000
Benzene	-	<200 <sub>d</sub>	Q	009
Methylene Chloride	0	0	<b>-</b>	200
Perchloroethylene	0	0	໙	9
Methyl Chloform	0	0	Q.	4
Trichloroethylene	-	-	QJ .	40

One landfill probe and two perimeter probes were sampled at this site. All analytical results are presented in Table 2-6, including the sampling depths for the landfill and perimeter probas.

 $<sup>\</sup>cdot$   $n_0$  = Limit of quentitation.

 $<sup>^{</sup>m C}$  ppbv = Parts per billion volume; original field data in units of ug/L.

d This value represents the highest daily analytical detection limit (method detection limit); no quantitate data were available.



SUMMARIZED ANALYTICAL RESULTS OF SITE NO. 14 LANDFILL GENERATION AND OFF-SITE GAS MIGRATION<sup>8</sup> TABLE 5-9.

	Land	Landfill	Pe	Perimeter
Compound	Number of Probes Above Average LOO	Highest Concentration (ppbv)	Number of Probes Above Average LOG	Highest Concentration (ppbv)
Велуапа	0	0	ત્ય	p09>
Methylene Chlorine	•	100	0	0
Oarchi ornethyl ene	. ლ	10	0	0
Methyl Chloforom	-	4	-	0.8
Trichloroethylene	-	Q	0	0
Chloroform	<b>-</b>	40	0	0

All analytical results are presented in Table  $^{
m a}$  Two landfill probes and three perimeter probes were sampled at this site. 2-7, including the sampling depths for the landfill and perimeter probes.

b LOQ = Limit of quantitation.

ppbv = Parts per billion volume; original field data in units of ug/L.

d This value represents the highest daily analytical detection limit (method detection limit); no quantitate data were available.

summarize the Table 2-6 and 2-7 results. Tables 5-8 and 5-9 each present the maximum concentration value detected above the limit of quantitation (LOQ) for the specified air contaminants listed in Table 1-1 for Sites 13 and 14, respectively. All other tested air contaminants were below the limit of quantitation.

## 5.2.5 Landfill Gas Testing Results for Site 22

Site 22 is located on the west side of the base, 140 feet east of Patrol Road and south of Waste Treatment Plant Aeration Basin. The site area is approximately 400 feet by 100 feet. Previously it was used as a burn pit and solid waste landfill. Site 22 and the surrounding area are being used to store construction materials. For the most part, the site is flat and covered with bare soil. Historical soil samples collected from this area by McLaren contained metal and wire pieces, concrete and asphalt, rubble, burned wood, glass, rubber, and sludge-like material. Composite analyses of the waste showed low to high concentrations of VOC and non-VOC compounds and elevated concentrations of heavy metals. Elevated concentrations of 13 base/neutral compounds and one PCB was detected. Base/neutral compounds included fluorene (170-510 ug/kg), acenaphthene (130-340 ug/kg), and phenanthrene (160-3,200 ug/kg). Total lead exceeded the TTLC value, and soluble antimony exceeded the STLC value. Oil and grease concentrations in the waste ranged from 2,910 mg/kg to 27,000 mg/kg.

Soil sample borings were drilled around the burn pit to characterize lateral migration from the site. These borings showed moderate to high concentrations to 80 feet. Analyses of soil samples around the pit showed a variety of volatile organic and nonvolatile organic compounds. Trichloroethylene was detected in all three borings at concentrations ranging from 55 to 4,600 ug/kg. Elevated concentrations from one to three base/neutral extractable compounds were detected. The results indicated significant lateral migration of contaminants, invluding chlorobenzene (23-6,600 ug/kg), ethylbenzene, TCE, toluene (12-5,200 ug/kg), total xylenes (380-31,000 ug/kg), acenaphthene (130-340 ug/kg), fluorene (170-510 ug/kg), phenanthrene

(160-3,200 ug/kg), and 2-methylnaphthalene. An area map with the sample locations and site area can be found in Figure 5-9.

A total of five probe samples were analyzed at Site 22, four samples were taken from inside the landfill area, and one taken at the west perimeter.

Five landfill samples originally were proposed for Site 22. The presence of surface water at the southeast end of the site resulted in a modification to the sampling strategy. Four landfill probe samples and one perimeter probe were sampled. The sampling depths ranged from 5 to 8 feet.

Landfill and perimeter probes were collected for Site 22 on December 10. A trace of rain occurred on that day. In the 72 hours prior to December 10, approximately 0.50 inches of rain occurred. Because Site 22 is covered with packed gravel, the Site 22 sampling area could not be hand augered to collect soil samples to inspect the soil moisture conditions at depth. Instead, soil conditions were estimated by collecting a hand auger sample at Site 8 the same day. The Site 8 hand auger sample indicated dry soil conditions at a 3-foot depth.

The analytical results for both gas characterization sampling, using landfill probes, and off-site gas migration sampling, using perimeter probes, for Site 22, are given in Table 2-8. Table 5-10 further summarizes the Table 2-8 results. Table 5-10 presents the maximum concentration value detected above the limit of quantitation (LOQ) for the specified air contaminants listed in Table 1-1. All other tested air contaminants were below LOQ.

#### 5.2.6 Landfill Gas Testing Results for Site 24

Site 24 is located approximately 900 feet east of Building 621 at the southern end of the base. The site area is approximately 515 feet by 80 feet by 11 feet deep. It was previously used as a solid waste landfill.

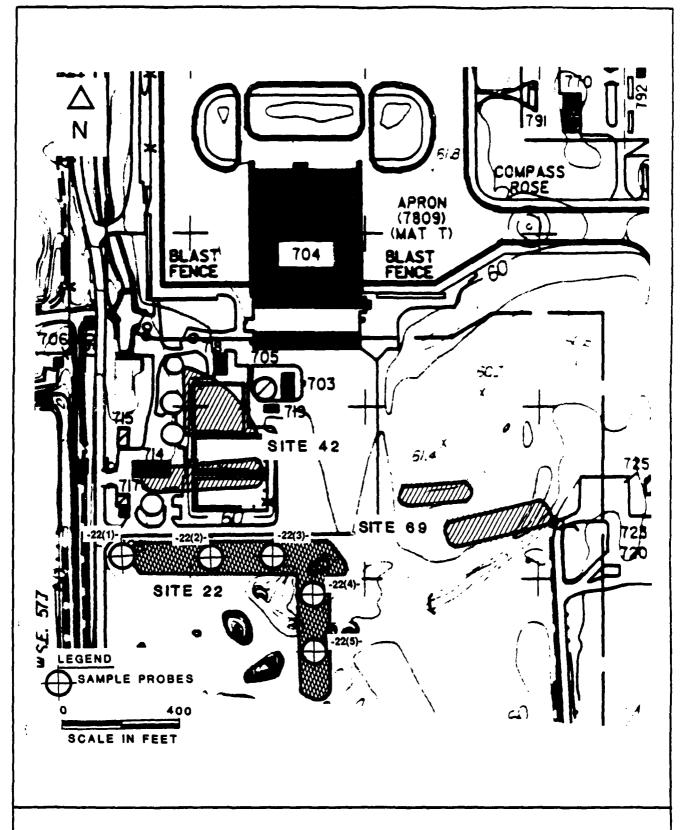


Figure 5-9. Sample Locations for Area C, Site 22, at McClellan AFB.



SUMMARIZED ANALYTICAL RESULTS OF SITE NO. 22 LANDFILL GENERATION AND OFF-SITE GAS MIGRATION<sup>®</sup> TABLE 5-10.

	Lanc	Landfill	91	rerimener
Compound	Number of Probes Above Average LOQ	Highest Concentration (ppbv)	Number of Probes Above Average LOQ	Highest Concentration [ppbv]
Vinyl Chloride	-	4,000	0	0
Perchloroethylene	ო	30	-	9
Methyl Chioform	ო	4	۴	88
Trichloroethylene	4	400	<b>~</b>	400

<sup>a</sup> Four landfill probes and one perimetsr probe were sampled at this site. All analytical results are presented in Table 2-8, including the sampling depths for the landfill and perimeter probes.

LOQ = Limit of quantitation.

c ppbv = Parts per billion volume; original field data in units of ug/L.

This value represents the highest daily analytical detection limit (method detection limit); no quantitate data were avail-

The site is partially covered by a drainage ditch and an asphalt parking lot. The remainder of the site is covered by native vegetation and is not currently in use. Historical soil samples collected from the area by McLaren contained low concentrations of three VOCs. One composite waste sample showed concentrations of four base/neutral extractable compounds and one acid extractable compound. An elevated concentrations of benzo(a)pyrene (1,200 ug/kg) was detected in this sample. Elevated total concentrations of five heavy metals were detected in composite waste samples. Total lead in one composite waste sample exceeded the DHS TILC.

Figure 5-10 shows the area around the landfill, the landfill and the probe locations.

A total of six probe samples were taken in the area of Site 24. Four probe samples were taken inside the landfill area and two were taken at the perimeter. The samples are labeled 24(1) through 24(6). The sample depths ranged from 2 to 8 feet; eight-foot sampling depths were reached on three of the six samples.

Landfill and perimeter probe samples were collected for Site 24 on December 14. No precipitation occurred on the sampling day or in the 72-hour period prior to December 14.

A hand auger was used to bore and collect soil samples which were inspected to determine the soil moisture conditions at depth in the sampling area. Hand auger samples collected on December 14 showed dry soil conditions at the 3-foot depth.

The analytical results for both gas characterization sampling, using landfill probes, and off-site gas migration sampling, using perimeter probes, for Site 24, are given in Table 2-9. Table 5-11 further summarizes the Table 2-9 results. Table 5-11 presents the maximum concentration value detected above the limit of quantitation (LOQ) for the specified air contaminants listed in Table 1-1. All other tested air contaminants were below the limit of quantitation.

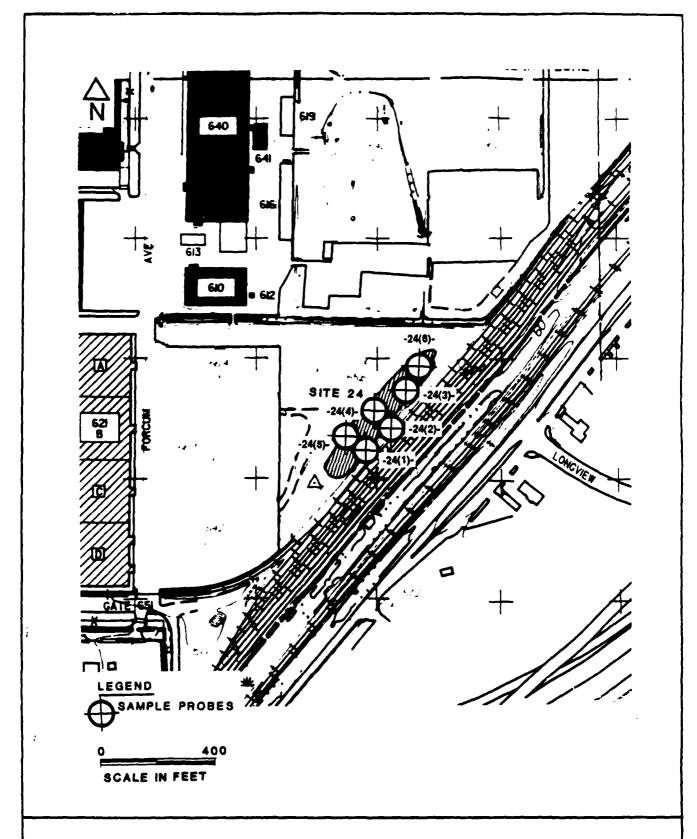


Figure 5-10. Sample Locations for Other Areas, Site 24, at McClellan AFB.



TABLE 5-11. SUMMARIZED ANALYTICAL RESULTS OF SITE NO. 24 LANDFILL GENERATION AND OFF-SITE GAS MIGRATION<sup>B</sup>

	Lan	Landfill	8	Perlmeter
Compound	Number of Probes Above Average LOO	Highest Concentration (ppbv)	Number of Probes Above Average LOQ	Highest Concentration [ppbv]
Perchloroethylene	1	တ	cu .	4
Carbon Tetrachloride	0	0	-	0.2
Methyl Chloroform	4	200	ઢા	લા
Trichloroethylene	4	80	໙	50

All analytical results are presented in Table Four landfill probes and two perimeter probes were sampled at this site. 2-9, including the sampling depths for the landfill and perimeter probes.

LOG = Limit of quantitation.

 $<sup>^{</sup>m c}$  ppbv = Parts per billion volume; original field data in units of ug/L.

d This value represents the highest daily analytical detection limit (method detection limit); no quantitate data were available.

#### 5.2.7 Landfill Gas Testing Results for Site 38

Site 38 is located in the southeast corner of the base under Building 475. The site was previously used as a sludge landfill, which also contained underground storage tanks. It measured approximately 600 feet long by 400 feet wide. The landfill currently is beneath an aircraft engine shop. The major features of the area include buildings 475, 473, and 429, which cover about 70 percent of the landfill area. Historical soil samples collected by McLaren, contained VOCs in soil samples from eight borings. Base/neutral compounds were detected in soil samples from seven borings. Non-priority pollutant compounds were detected in one boring. Elevated concentrations of total heavy metals were detected in two borings. Elevated concentrations of oil and grease were detected in two borings.

The sample from 9 feet in one boring contained concentrations of 13 VOCs ranging from 180 ug/kg for chloroform to 430,000 ug/kg for total xylenes. Chlorobenzene, ethylbenzene, toluene, 2-butanone, 2-hexanone, 4-methyl-2-pentanone, and total xylenes were detected at concentrations over 10,000 ug/kg. This sample also showed concentrations of four base/neutral extractable compounds ranging from 130 ug/kg for phenanthrene to 230 ug/kg for dinitrotoluene, and concentrations of four non-priority pollutant compounds ranging from 100 ug/kg for dibenzofuran to 580 ug/kg for 2-methylnaphthalene. Oil and grease were detected at a concentrations of 540 mg/kg.

Sampling of the headspace over auger boring cuttings with an HNu instrument and at borehole locations indicated low readings (<10 ppm) in 12 borings, moderate (10-100 ppm) in six borings, and high (>100 ppm) in two borings.

HNu cutting and headspace readings varied from less than 10 to 300 ppm. Strong odors were noted in six borings. Discolored soil was observed near the surface in six borings.

Figure 5-11 contains an area map, the landfill boundaries and the soil probe locations. The eight-foot sampling target depth was reached on one probe only; the range of probe depths was 2 to 6 feet. Two perimeter probes 38(6) and 38(7) were driven to 3 feet. Water was encountered at this depth and was sucked into the vacuum pump which prevented sampling at these perimeter locations.

Landfill probe samples were collected for Site 38 on December 11. No precipitation occurred on the sampling day; however, in the 72 hours prior to December 11, approximately 0.50 inches plus a "trace" of rain had fallen. Site 38 is covered by asphalt, concrete and/or gravel-packed parking lots. No hand auger samples were taken to determine the soil moisture conditions at depth prior to collecting landfill and perimeter probe samples.

The analytical results for gas characterization sampling, using landfill probes, for Site 38, is given in Table 2-10. Table 5-12 further summarizes the Table 2-10 results. Table 5-12 presents the maximum concentration value detected above the limit of quantitation (LOQ) for the specified air contaminants listed in Table 1-1. All other tested air contaminants were below the limit of quantitation.

#### 5.2.8 Landfill Gas Testing Results for Site 42

Site 42 is located 140 feet north of Site 22 under the Waste Treatment Plant on the west side of the base. Site 42 is approximately 210 feet by 50 feet by 6 feet deep. Previously it was used as an oil storage area and solid waste landfill. Historical soil samples collected from the area by McLaren contained low to high concentrations of VOCs, elevated levels of chloroform, and low concentrations of base/neutral extractable compounds. PCB 1254 was detected in one sample at an elevated concentration.

The burn pit at Site 42 was found to contain buried debris consisting of burnt debris, wood, plastic, and metal fragments. Analysis of the waste showed low to moderate concentrations of VOCs and non-VOCs. Elevated

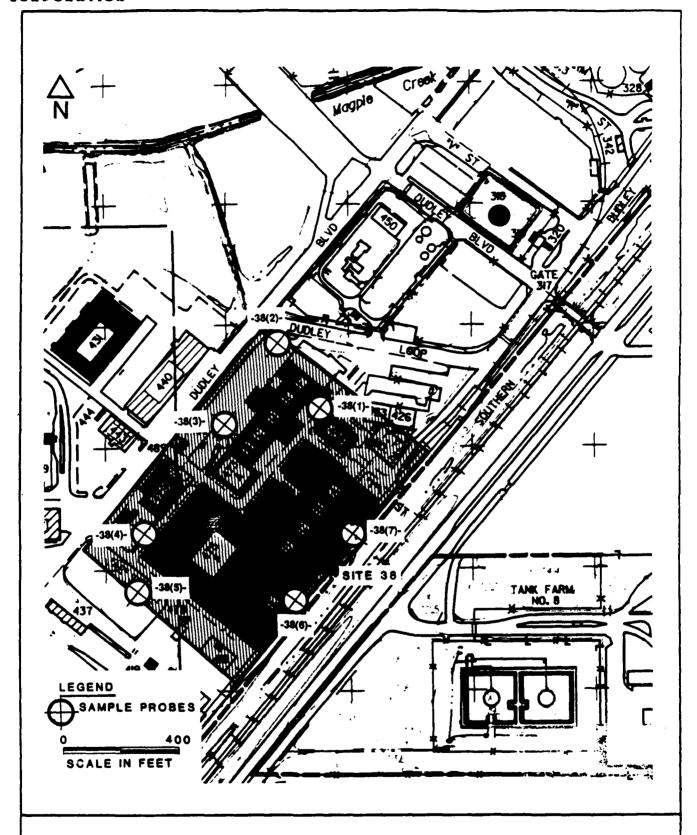


Figure 5-11. Sample Locations for Area A, Site 38, at McClellan AFB.



TABLE 5-12, SUMMARIZED ANALYTICAL RESULTS OF SITE NO. 38 LANDFILL GENERATION AND OFF-SITE GAS MIGRATION

	Lanc	Landfill	Pe	Perimeter
Compound	Number of Probes Above Average LOO	Highest Concentration (ppbv)	Number of Probes Above Average LDO	Highest Concentration {ppbv}
Vinvl Chloride	Cu	, <200 <sub>0</sub>	æ	œ
Benzene	ઢ	09>	œ	ω
Ethylene Dibromide	ઢ	<b>0°2°</b>	æ	œ.
Ethylene Dichloride	a	n 708>	Œ	o o
Methylene Chloride	a	,001>	σ	0
Perchloroethylene	ဇာ	300	œ.	œ.
Carbon Tetrachlorida	۳	8	ø	00
Methyl Chloroform	4	100	æ.	©
Trichloroethylene	4	100	<b>6</b> 0	<b>0</b>

All analytical results are presented in Table Four landfill probes and no perimeter probes were sampled at this site. 2-10, including the sampling depths for the landfill and perimeter probes.

b LOQ = Limit of quantitation.

ppbv = Parts per billion volume; original field data in units of ug/L.

d This value represents the highest daily analytical detection limit (method detection limit); no quantitate data were avail-

<sup>8</sup> Site conditions prohibited collection of samples.

concentrations of phenanthrene was detected. Elevated concentrations of oil and grease and heavy metals also were detected, including total copper above TTLC values, and soluble cadmium and soluble lead above STLC values.

Analyses of soil samples from around Site 42 detected a variety of VOC and non-VOC compounds. VOCs detected in shallow soils include trichloroethylene (640-5,400 ug/kg) and trans-1,2-dichloroethylene (880-3,400 ug/kg). One soil sample boring to the southeast of the Site 42 oil storage ponds showed a number of VOC and non-VOC compounds, of which elevated concentrations of acenaphthylene (150 ug/kg), fluorene (240-560 ug/kg), and phenanthrene (160-520 ug/kg) were detected.

Figure 5-12 is an area map of the landfill location and the sample points 42(1) through 42(4). A total of four probe samples were taken; one landfill probe and three perimeter probes. Probe sample depths ranged from 3 to 6 feet with refusal on all but one sample, possibly due to subsurface construction material.

Landfill and perimeter probe samples were collected for Site 42 on December 11. No precipitation occurred on the sampling day; however in the 72 hours prior to December 11, approximately 0.50 inches plus a "trace" of rain had fallen. Site 42 is a covered site. No hand auger samples were taken to determine the soil moisture conditions at depth prior to collecting landfill and perimeter probe samples.

The analytical results for both gas characterization sampling, using landfill probes, and off-site gas migration sampling, using perimeter probes, are given in Table 2-12. Table 5-13 further summarizes the Table 2-12 results. Table 5-13 presents the maximum concentration value detected above the limit of quantitation (LOQ) for the specified air contaminants listed in Table 1-1. All other tested air contaminants were below the limit of quantitation.

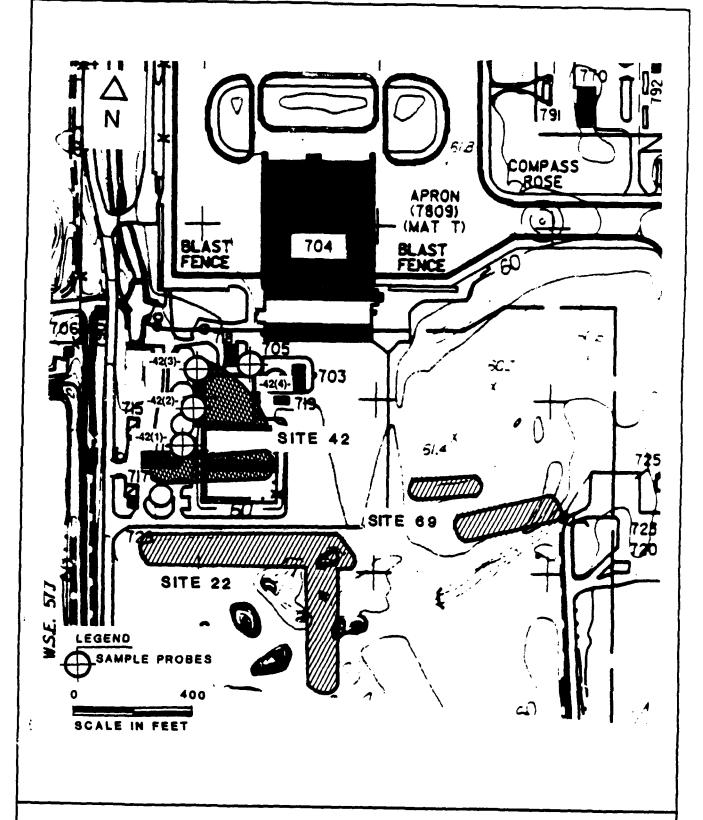


Figure 5-12. Sample Locations for Area C, Site 42, at McClellan AFB.



SUMMARIZED ANALYTICAL RESULTS OF SITE NO. 42 LANDFILL GENERATION AND OFF-SITE GAS MIGRATION<sup>8</sup> TABLE 5-13.

	ne T	Landfill	Pe	Perimeter
Compound	Number of Probes Above Average LOG	Highest Concentration (ppbv)	Number of Probes Above Average LOO	Highest Concentration (ppbv)
Vinyl Chloride	ઢ	\( \) \( \)	0	
Benzene	໙	, 09>	00	Φ
Ethylene Dibromide	Q	<0.5 40.5	03	œ
Ethylene Dichloride	໙	p 08>	9	ω
Methylene Chloride	໙	×100	0	σ
Perchloroethylene	co.	30	0	ω
Methyl Chloroform	4	200	<b>t</b> o	00
Trichloroethylene	מו	3,000	O)	Φ

All analytical results are presented in Table Five landfill probes and no perimeter probes were sampled at this site. 2-11, including the sampling depths for the lendfill and perimeter probes.

 $LOG \approx Limit of quantitation,$ 

ppbv = Parts per billion volume; original field data in units of ug/L.

d This value represents the highest daily analytical detection limit (method detection limit); no quantitate data were available.

Site conditions prohibited collection of samples.



#### 5.2.9 Landrill Gas Testing Results for Site 43

Site 43 is located on the west side of the base, 800 feet south of Site 13 and 600 feet northwest from Building 704. The site area is approximately 405 feet by 50 feet by 10 feet deep. Previously it was used as a solid waste landfill. Some construction rubble is lying over the site. Historical soil samples collected from the area by McLaren Engineering contained burned wood, metal pieces, wire, glass, and plastic. Most of the waste appeared burned. Analyses of the waste showed a variety of VOCs. Also detected were a number of base/neutral extractable compounds, of which acenaphthene (370 ug/kg), benzo(a)anthracene (130-1,100 ug/kg), chrysene (260-1,500 ug/kg), 2,4-dinitrotoluene (1,000 ug/kg), fluorene (380-460 ug/kg), nitrobenzene (750 ug/kg), and phenanthrene (1,400-1,800 ug/kg) were detected at elevated levels. A number of other non-VOC compounds were detected, including PCB 1254 in one boring at 4,600 ug/kg. Also, elevated concentrations of oil and grease up to 17,000 mg/kg and heavy metals were detected. Concentrations of total cadmium and total lead were above TTLC values. Concentrations of soluble cadmium and soluble lead were above STLC values.

Figure 5-13 contains an area map, reflecting the landfill area and sample locations 43(1) through 43(6).

A total of six probes were taken; three landfill and three perimeter. The depth of the probes ranged 4 to 7 feet. During installation, all of the probes had refusal problems from what appeared to be sandstone a few feet below the surface.

Landfill and perimeter probe samples were collected for Site 43 on December 7. No precipitation occurred on the sampling day, but, in the 72-hour period prior to sampling, approximately 0.88 inches of rain had fallen. Hand augers were used to bore and collect soil samples which were inspected to determine the soil moisture conditions at depth in the sampling area. Hand auger samples were collected on December 7 on the western portion of Site 43. They showed dry soil conditions at a 2-foot depth.

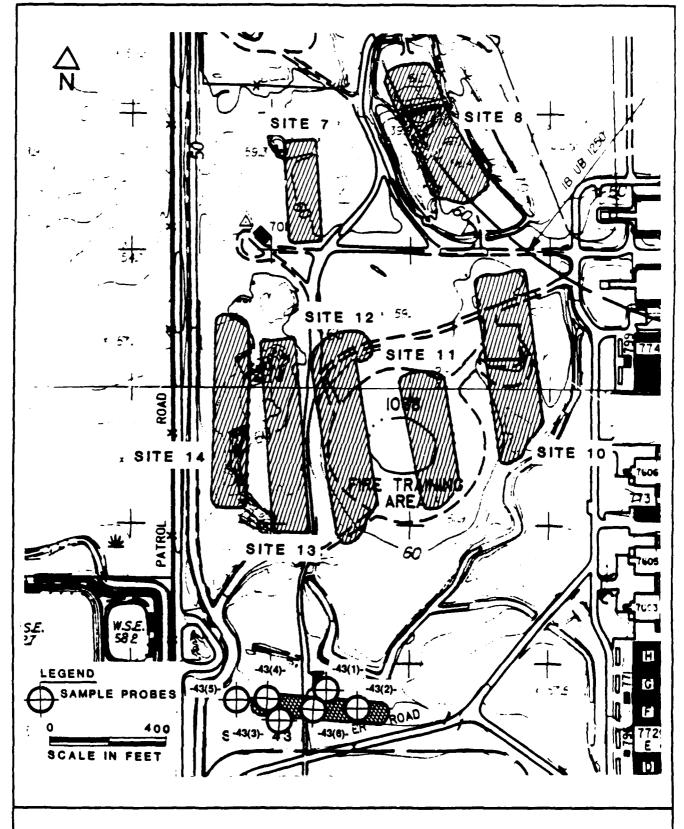


Figure 5-13. Sample Locations for Area C, Site 43, at McClellan AFB.

The analytical results for both gas characterization sampling, using landfill probes, and off-site gas migration sampling, using perimeter probes, for Site 43, are given in Table 2-12. Table 5-14 further summarizes the Table 2-12 results. Table 5-14 presents the maximum concentration value detected above the limit of quantitation (LOQ) for the specified air contaminants listed in Table 1-1. All other tested air contaminants were below the limit of quantitation.

### 5.2.10 Landfill Gas Testing Results for Site 69

Site 69 is located 380 feet northwest of Building 704 on the west side of the base. The site area consists of two burn pits: one is 180 feet by 36 feet, and the other is 350 feet by 60 feet. The two sites are approximately 40 feet apart and have been treated as one site. The site does not appear to have any current use. Historical soil samples collected from the east pit by McLaren contained metal pieces, plastic, rubber, concrete, and wood. A composite analysis of the waste showed a variety of VOC and non-VOC compounds. VOC detected included vinyl chloride (260-850 ug/kg), trichloroethylene (420-440 ug/kg), and trans-1,2-dichloroethylene (210-370 ug/kg). This sample also showed elevated concentrations of five total heavy metals, and concentrations of soluble cadmium and soluble lead above STLC values. Historical soil samples collected from the west pit by McLaren contained metals pieces, sludge, rubber, plastic, and glass. A composite analysis of the waste showed a variety of VOC and non-VOC compounds, including phenanthrene (200 ug/kg) and pyrene (250 ug/kg) at elevated levels. This sample also showed elevated concentrations of four total heavy metals, including total lead above TTLC values. The concentration of soluble lead was above STLC values.

Figure 5-14 contains an area map reflecting the landfill area and sample locations, labeled 69(1) through 69(8). A total of eight probe samples were taken; six landfill and two perimeter probes. The range of probe sampling depths was three to eight feet; and eight-foot target depth was reached on five of the eight probes.



TABLE 5-14. SUMMARIZED ANALYTICAL RESULTS OF SITE NO. 43 LANDFILL GENERATION AND OFF-SITE GAS MIGRATION

	Lan	Landfill	9A	Perimeter
Compound	Number of Probes Above Average LOO	Highest Concentration (ppbv)	Number of Probes Above Average LOO	Highest Concentration [ppbv]
Benzene	-	009	0	O
Perchloroethylene	ณ	,	0	0
Methyl Chloroform	<b>~</b>	08°0>	-	0.8
Trichloroethylene	ო	4	ო	4

<sup>&</sup>lt;sup>8</sup> Four landfill probes and two perimeter probes were sampled at this site. All analytical results are presented in Table 2-12, including the sampling depths for the landfill and perimeter probes.

b LOQ = Limit of quantitation.

 $<sup>^{</sup>m C}$  ppbv = Parts per cillion volume; original field data in units of ug/L.

d This value represents the highest deily analytical detection limit (method detection limit); no quantitate data were avail-

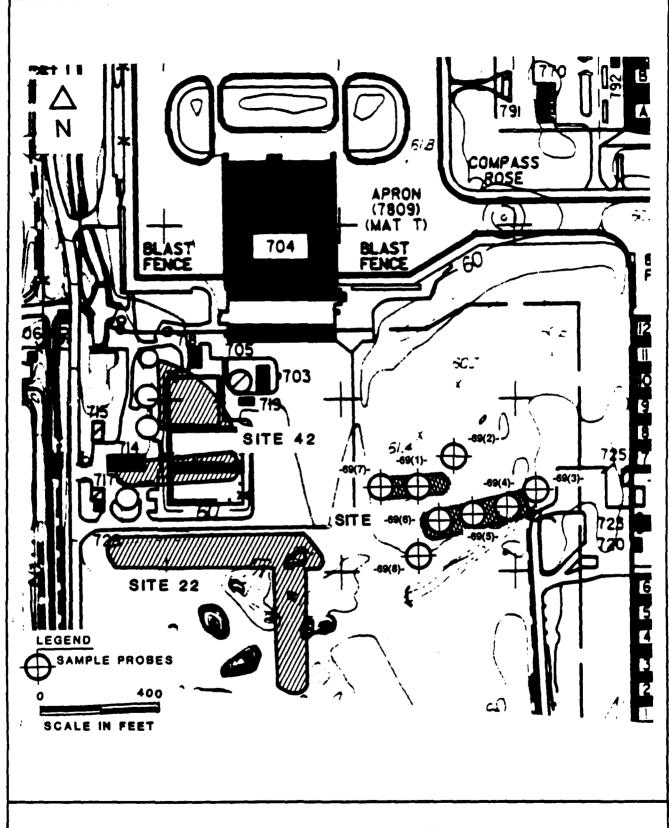


Figure 5-14. Sample Locations for Area C, Site 69, at McClellan AFB.

Landfill and perimeter probe samples were collected for Site 69 on December 9 and 10. Approximately 0.1 inch of rain occurred on December 9, and a "trace" of rain fell on December 10. In the 72 hours prior to sampling on the 9th, approximately 1.0 inches of precipitation occurred. In the 72 hours prior to sampling on the 10th, approximately 0.50 inches plus a "trace" of rain occurred.

A hand auger was used to bore and collect soil samples which were inspected to determine the soil moisture conditions at depth in the sampling area. Hand auger samples were collected on December 9. The soil was saturated to an approximate depth of 4 feet. Below this depth was an impenetrable layer of gravel was encountered.

The analytical results for landfill gas characterization sampling, using landfill probes, and off-site gas migration sampling, using perimeter probes, for Site 69, are given in Table 2-13. Table 5-15 further summarizes the Table 2-13 results. Table 5-15 presents the maximum concentration value detected above the limit of quantitation (LOQ) for the specified air contaminants listed in Table 1-1. All other tested air contaminants were below the limit of quantitation.

### 5.2.11 Soil-Vapor Wells

There are nine vapor wells located west of the Area D cap. The locations of these wells are shown in Figure 5-15. These nine wells are grouped into three sets of three-well clusters. Each cluster is made up of a shallow, middle, and deep monitoring zone well of respective depths of 10 to 20 feet, 35 to 50 feet, and 65 to 80 feet. A schematic diagram of the well construction is given in Figure 5-16. One air sample was collected from each of the nine vapor wells. Sampling of these vapor well samples constituted gas migration testing for the Area D cap. No ground probes were installed in the Area D clay cap.



SUMMARIZED ANALYTICAL RESULTS OF SITE NO, 69 ANDFILL GENERATION AND OFF-SITE GAS MIGRATION<sup>8</sup> TABLE 5-15.

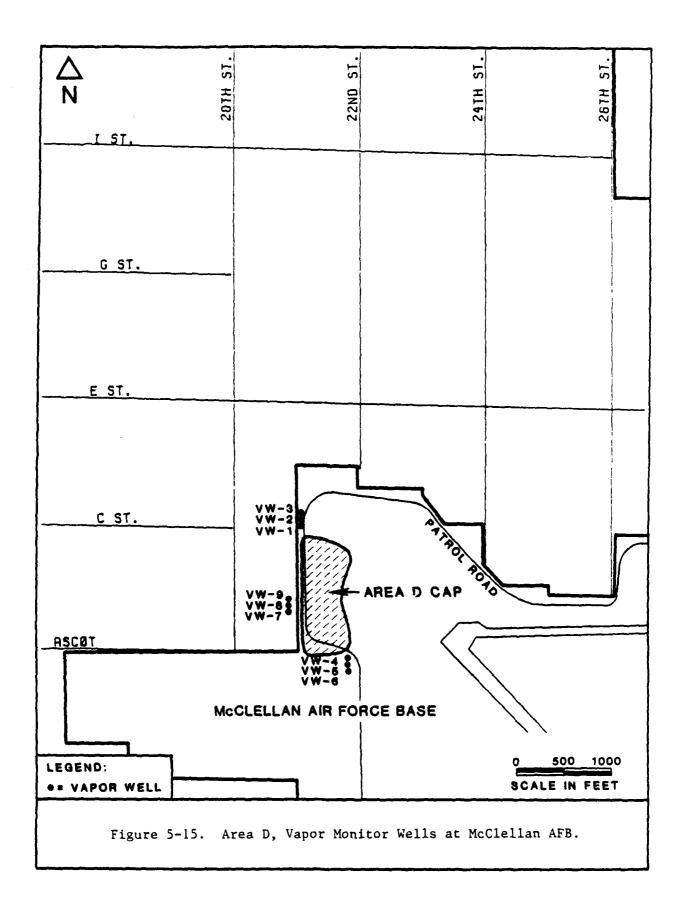
	Lan	Landfill	Pe	Perimeter
Compound	Number of Probes Above Average LOO	Highest Concentration (ppbv)	Number of Probes Above Average LOQ	Highest Concentration (ppbv)
Vinyl Chlorida	-	400	0	0
Benzene	F	1,000	0	0
Perchloroethylene	QI	4	0	0
Methyl Chloroform	ဖ	4	ณ	4
Trichloroethylene	ယ	40	໙	80

All analytical results are presented in Table Six landfill probes and two perimeter probes were sampled at this site, 2-13, including the sampling depths for the landfill and perimeter probes.

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LOO = Limit of quantitation.

bpbv = Parts per billion volume; original field data in units of ug/L.





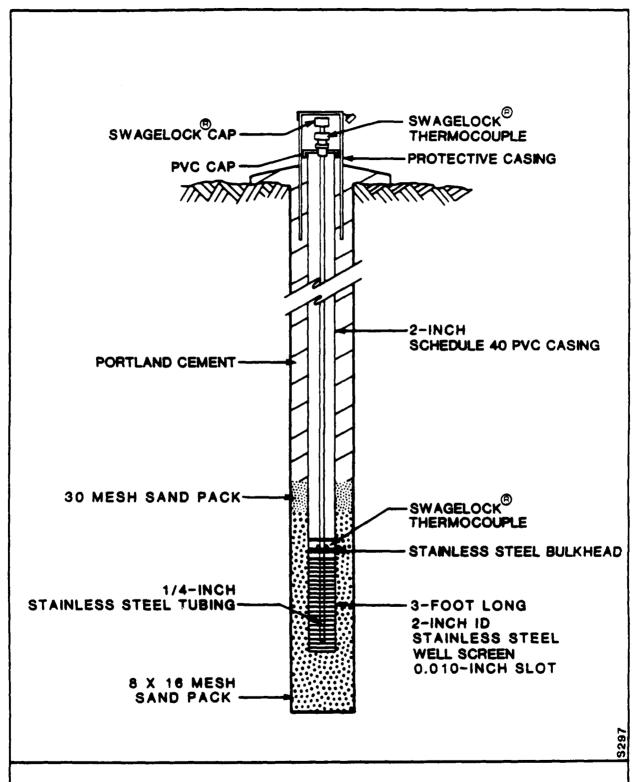


Figure 5-16. Schematic Diagram of Area D, Soil Vapor Well Completion at McClellan AFB.

The nine vapor wells were sampled by taking soil gas samples as follows. The vapor wells were calculated to hold approximately two liters of volume (see calculation sheet Appendix E). The vacuum pump used by Tracer to evacuate air from soil probes evacuated well in excess of 4 liters per minute (1pm). A rotometer was used by Tracer to measure the air flow. A 4.1 lpm air flow was achieved. The vacuum pump was allowed to run for approximately two minutes to ensure soil gases were being sampled; while the vacuum pump continued to run, a syringe sample was collected and analyzed the same way a soil probe sample was. The dates of sample collection at the Radian Vapor wells were December 7th and 15th.

The analytical results for the vapor wells are given in Table 2-14. Table 5-16 further summarizes the Table 2-14 results. Table 5-16 presents the maximum concentration value detected above the limit of quantitation (LOQ) for the specified air contaminants listed in Table 1-1. All other tested air contaminants were below the limit of quantitation.

### 5.2.12 Gas Vents in Area D

Area D contains a gas collection and monitoring system that consists of 32 gas vents which extend into the solid waste under the Area D cap. Each gas vent is designed to allow for the measurement of gas pressure. However, the gas generated from the landfill can also be collected. No ground probes were installed in the Area D clay cap. The soil-gas generation potential of this area was assessed by collecting soil-gas samples directly from the pressure port of each vent.

A total of 14 gas vents were sampled; Figure 5-17 shows their exact locations.

Gas vent samples were collected December 7, 8, 9, 11, 14 and 15th. The gas vents were calculated to contain approximately 17 liters of gas (see Appendix E for worksheet); although the system is interconnected, the purge volume was calculated for the length of vertical pipe extending over the land

TABLE 5-16. SUMMARIZED ANALYTICAL RESULTS OF AREA D SOIL-GAS MONITOR WELLS<sup>8</sup>

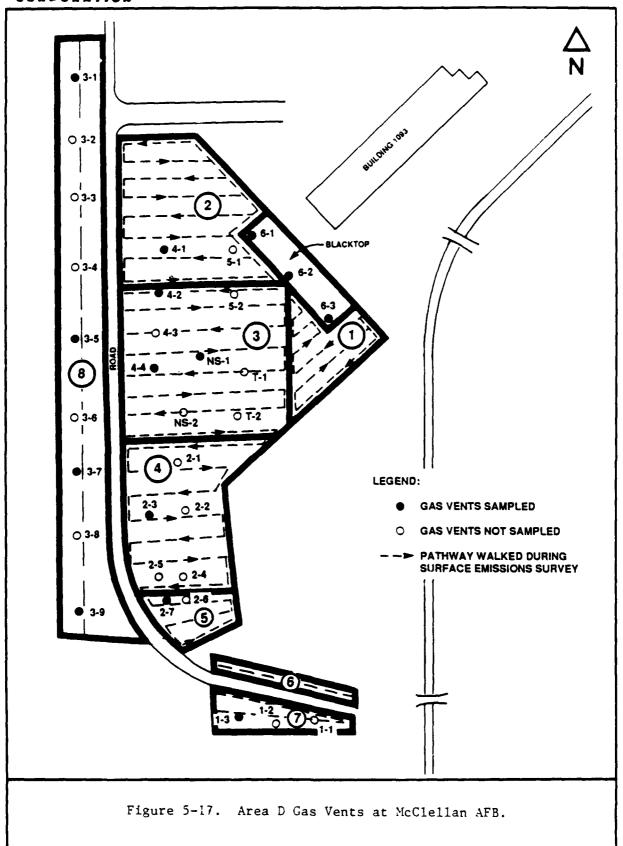
Compound	Number of Semples Above Average LOO	Highest Concentration (ppbv)
Vinyl Chloride	9	400 <sup>d</sup>
Benzene	9	
Ethylene Dibromide	g	] [E>
Ethylene Dichloride	9	\
Methylene Chloride	LC)	, 00e>
Perchloroethylene	S	06
Carbon Tetrachloride	7	30
Methyl Chlaroform	æ	006
Trichloroethylene	G	000.49
Chlaroform	9	2 4>

All analytical results are presented in Table 2-14, including the Nine soil gas monitor wells were sampled at this site. sampling depths for the landfill and perimeter probes.

LOQ = Limit of quantitation.

ppbv = Parts per billion volume; original field data in units of ug/L.

d This value represents the highest daily analytical detection limit (method detection limit); no quantitate data were avail-



0188-017-3

surface. A flow rate of 4.1 lpm was achieved by the vacuum pump. Over two gas vent volumes were evacuated by running the vacuum pump at the well for nine minutes per sample. The syringe sample was taken while the vacuum pump continued to run.

The analytical results for the vapor wells are given in Table 2-15. Table 5-17 further summarizes the Table 2-15 results. Table 5-17 presents the maximum concentration value detected above the limit of quantitation (LOQ) for the specified air contaminants listed in Table 1-1. All other tested air contaminants were below the limit of quantitation.



TABLE 5-17. SUMMARIZED ANALYTICAL RESULTS OF AREA D GAS COLLECTION SYSTEM  $^{\mathrm{B}}$ 

Compound	Number of Semples Above Averege LOO	Highest Concentration (ppbv)
Vinyl Chloride	4	, csoo <sub>d</sub>
Benzene	4	1001
Ethylene Dibromide	ဗ	[8°0>
Ethylene Dichloride	63	7001>
Methylene Chloride	62	,002>
Perchloroethylene	8	້ຕິ
Carbon Tetrachlorida	က	g*0>
Methyl Chloform	13	2,000
Trichloroethylene	-11	2,000,
Chloroform	co	°5>

All analytical results are presented in Table 2-15, including the sampling 8 Fourteen gas vents were sampled at this site. depths for the landfill and perimeter probes.

LOQ = Limit of quantitation.

ppbv = Parts per billion volume; original field data in units of ug/L.

d This value represents the highest daily analytical detection limit (method detection limit); no quantitate date were svail-

### 6.0 REMEDIAL ACTION

No remedial action has been performed at the McClellan AFB landfill sites numbered in this report Sites 7, 8, 10, 11, 12, 13, 14, 22, 38, 43, and 69. The Area D vapor monitor wells, identified as VW-1 through VW-9 and the gas vents identified as VC-1 through VC-6.3 are components of the Area D remedial action.

### 6.1 Ordered

No remedial action has been ordered at the landfill sites evaluated in this investigation.

### 6.2 Results

Because no remedial action has been ordered at the sites evaluated in this migration, no results for remedial action exist.

Each of the 13 landfill sites assessed in this field testing program and the Area D soil-vapor wells and gas vent system have been and will continue to be evaluted under the USAF's Installation Restoration Program and in accordance with the Comprehensive Environmental Response and Liability Act of 1980, the Superfund Amendments and Reauthorization Act of 1986, and the National Oil and Hazardous Waste Contingency Plan. It is anticipated that the field sampling techniques and analytical procedures used in this assessment to determine the gas generation and gas migration potential for each site will be interpreted using risk assessment techniques to help qualify the relative risk posed by each site to public health and the environment.

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<u>Disposal Site Testing Guidelines</u>. California Air Resources Board,

Sacramento, California.

### APPENDIX A

Condensed Analytical Results (ppmv)

CALIFORNIA
SACRANENTO,
CORPORATION/
RADIAN C

KHOIHN CORPORHIION/SHCRHRENIG.	Ž Ž	15 / NOT 11	-CKHCIEN C		Ξ.							Varigi
Samp Le	Dept	Depth Date	CH2C12 pps	CHC13	1,2~DCH ppm	TCA PPM	CC14	TCE PPM	FOE	PCE PPCE	ĝ Ĉ	Chloride ppa
\$61-14P \$62-14L \$628-14L		12/02 12/02 12/03	<0.03 <0.03 0.1	<pre>&lt;0.0004 &lt;0.0004 0.04</pre>	<0.02 <0.02 <0.02	<pre></pre>	0.00006 0.00005 0.00002	<0.0004 <0.0004 0.002	60.0001 60.0001 60.0001	0.0002 <0.0002 0.01	<0.01 <0.01 <0.001	<0.01 <0.01 <0.02
263-14P 264-14P 866-13P	ស្ស មាល់ ស្រុ	.12/04 12/04 12/04	6.01 60.01 10.00	<0.0002 <0.0002 <0.0002	66.01 66.01 60.01	0.0004 0.0008 0.0008	0.0001 <0.00002 <0.00002	<0.0002 <0.0002 0.004	<0.0001 <0.0001 <0.0001	0.0001 0.0004 0.004	0.06 0.06 0.06	<0.02 <0.02 <0.02
\$66-13L \$67-13P \$68-7L	ណ	12/04 12/04 12/04	<0.03 0.2 3	<pre>&lt;0.0004 &lt;0.0004 &lt;0.004</pre>	60.02 0.02 0.02	0.0004 0.004 0.02	<0.00005 <0.00005 <0.00005	0.001 0.04 0.4	<0.0002<0.0002<0.0000000000000000000000	0.0002 0.006 0.3	0.2 0.6 22	0.03 5.23
\$69-7L \$610-7L \$611-7L	in the second	12/05 12/06 12/05	<0.03 9 5	<pre>&lt;0.0004 0.004 &lt;0.004 </pre>	<0.02 <0.02 <0.2	0.0008 0.1 <0.002	<0.00003 <0.00003 <0.00003	0.01 0.04 0.4	<pre>&lt;0.0003 &lt;0.0003 &lt;0.0003</pre>	0.06 0.04 0.2	0.01 0.01 0.01	0.08 0.08 2
2612-71 2613-7P 2614-10P	စ်ခဲ့င်	12/08 12/0 <b>5</b> 12/06	0.1 0.01	<0.0008 <0.0004 <0.0002	<0.05 <0.02 <0.01	0.006 0.0004 0.0004	.0.00008 0.0001 0.0001	0.04 0.001 0.0004	<pre>&lt;0.0004 &lt;0.0003 &lt;0.00006</pre>	0.04 •0.00008 0.00008	0.07 0.01 0.06	0.08 0.03 0.02
\$615~10P \$616-10P \$617~11P	ခဲ့ခဲ့ခဲ့	12/08 12/05 12/05	0.03 0.03 0.01	0.0004 0.0004 0.0002	<0.02 <0.02 <0.01	<0.0002 <0.0002 <0.00008	<0.00003 <0.00003 <0.00002	<pre>&lt;0.0004 &lt;0.0004 &lt;0.0002 *</pre>	<0.0003 <0.0003 <0.00000 <0.00000 <0.00000	<0. 000008<0. 000008<0. 000008	.c. c1 .0. 01 0. 006	20.03 0.03 0.03
VM - 3 VM - 2 VM - 1		12/07 12/07 12/07	<0.03 <0.3 <0.02	<0.0004 <0.004 <0.002	<0.006 0.2 <0.2	<0.0002 <0.002 <0.0008	0.01 0.03 0.003	0.01 0.08 <0.002	<0.0003 <0.0003 <0.0003 <0.0001	<pre>&lt;0.00009 &lt;0.0009 &lt;0.00004</pre>	0.0% 0.2% 0.1	0.04 0.04 0.03
8 ( ) 8 ( ) 10 ( )	ស្តិត សំតិត	12/08 12/07 12/07	<0.06 <0.02 <0.06	<0.0006<0.0006<0.0000000000000000000000	0.05 0.02 0.05	0.08 0.006 0.02	0.00006 0.00002 0.00008	0.02 0.001 0.004	<pre>&lt;0.0003 &lt;0.0001 &lt;0.0004</pre>	<0.0001 <0.0001 0.0002	.0.0. <0.01 <0.06	<0.04 <0.03 <0.10
9618~43P 9619~43L 9620~43E	น้า * * * ไ- ไ- น้า	12707 12707 12707	0.02 <0.02 0.02	<0.0002 <0.0002 <0.0002	0.02 0.03 0.03	0.0002 0.0002 0.0008	0.00005 0.00006 0.0001	0.001 0.002 0.004	<ul><li>0.0001</li><li>0.0001</li><li>0.0001</li></ul>	0,0001 0,001 0,00004	0.03 0.01 0.01	0.00 0.00 0.00 0.00
5621 - 43L 5622 - 43P 5623 - 43L	े के के	12/05 12/07 12/02	0.05 0.02 0.02	<0.0002 <0.0002 <0.0002	0.05 0.02 0.02 0.02	0.0004 0.0004 <0.0008	0.0001 0.00003 0.00002	0.002 0.001 0.004	<0.0001 <0.0001 <0.0001 <0.0001	<ul><li>0.00004</li><li>0.00004</li><li>0.0006</li></ul>	0.6 0.01 0.01	0.03 0.03 0.03
5624-12P 5626-12P 5626-11P	សំចំលំ	12/07 12/07 12/07	.0.02 .0.6 .0.02	<0.0002 2 <0.0002	0.02 0.5 0.02	0.004 <0.004 0.0006	.n. 00002 u. 06 <0. 00002	0.004 8 0.004	<0.0001 0.004 <0.0001	0.000 0.000	0.82 0.82 0.01	20.00 0.00 0.00

**Tracer Research Corporation** 

Notations: 1 interference with adjacent peaks NM not analyzed

Checked by J. Tangeman

Analyzed by 0. Abranovid

Proofed by L. Laplander

1											
CH9 PP9		\$. \$. \$. \$. \$. \$. \$. \$.	<2,100 74,000 32,000	<1,100 2,100 99,000	<pre>&lt;1,100 &lt;1,100 &lt;1,100 &lt;1,100</pre>	<pre>&lt;1,100 &lt;1,100 &lt;1,100</pre>	<pre>&lt;4,600 &lt;4,600 &lt;4,600 &lt;4,600</pre>	<5,400 <4,600 <4,600	<4,600 <4,600 <4,600	<4,600 <4,600 <4,600	<4,600 37,000 26,000
N2 Ppm	000	840,000 840,000 870,000	840,000 \$50,000 670,000	800,000 820,000 430,000	800,000 820,000 820,000	780, 000 800, 000 850, 000	870,000 870,000 840,000	82,000 850,000 820,000	890,000 890,000 820,000	440,000 660,000 870,000	850,000 800,000 840,000
02 ppm	140,000 120,000 170,000	220,000 200,000 94,000	190,000 48,000 94,000	160,000 110,000 17,000	94,000 230,000 230,000	200,000 220,000 110,000	200, 000 200, 000 200, 000	140,000 200,000 190,000	190,000 160,000 160,000	130,000 160,000 200,000	170,000 30,000 19,000
C02	<21,000 <21,000 53,000	<910 2,200 9,100	2,000 23,000 19,000	6,300 9,100 35,000	11,000 740 <490	1,200 1,500 9.700	910 540 <2,100	6,300 1,600 3,400	2,100 6,800 1,800	2,100 800 570	2,900 13,000 6,300
Depth Date		12/04 12/04 12/04	12/04 12/04 12/04	12/05 12/05 12/05	12/05 12/05 12/05	12/05 12/05 12/05	12/07 12/07 12/07	12/08 12/07 12/07	12/07 12/07 12/07	12/07 12/07 12/07	12/07 12/07 12/07
Hepti	30.00 30.00	ນ ດ ທີ່ຄະນີ ທີ່	0 · 0	្រក្ ព្រំ	อังจั	<u>ចំ</u> ចំ		ពិនិតិ	n	ि मैं में	ពុំធ្វាធ្វា
ं के किया है।	ا ا	563-146 564-146 565-136	566~13L 567~13P 568~7L	56'4-7L 5610-7L 5611-7L	5012-7t 5613-7P 5614-10P	\$018-10P \$616-10P \$617-11P	0M-3 0M-2 0M-1	0 0 0 2 2 2 5 3 3	5518~43P \$1819~43L \$620~43P	5621~43L 5622~43P 5629~43L	5624-128 5625-128 5626-118

Tracer Research Corporation

Notations: I interference with adjacent peaks NH not analyzed

Analyzed by D. Abranovid Checked by J. Tangeman

Princed by

CALIFORNIA
PORRTION/SACRAMENTO,
RADIAN CORE

11816	Chloride	0.04 0.04 0.04 0.04	0.05 0.05 0.05 0.05	0.07 0.4 0.07	0.00 0.00 0.00	0.00 10.00 10.00	.0.03 .0.01	0.0 0.01 0.03	60.03 60.03 50.03	0,08 '4,02 80	0.00	2000 2000 2000	0.1 0.10	Sorporation
	Benzene ppii	<0.03 <0.03 <0.01	60.00 0.01 0.01	6.01 1 10.03	6.00 0.00 0.00	.0.006 0.006 0.006	.001 .0006 1	0.006 0.006 0.01	0.07 0.0 0.006	.0.03 0.002 2	-0.0e 0.006 -0.08	0.006 0.006 0.006 0.00	<u>8</u> 000 000	Tracer Research Corporation
	P.C.E.	<pre>&lt;0.0001 &lt;0.0001 &lt;0.00006</pre>	<pre>&lt;0.00006 &lt;0.00006 &lt;0.00006</pre>	<0.00006 <0.0001 0.004	0,003 <0.00006 <0.00006	<pre>&lt;0.00004 &lt;0.00004 0.03</pre>	0.003 0.006 0.003	0.01 10.0	0.2 0.04 0.0008	0.0 0.08 0.6	0.03 0.003 0.02	0.003 0.008 0.3 0.3	0.09 u.000u.	Trace
	EDG Ppm	<pre>&lt;0.0004</pre> <0.0004<0.0001	<pre>&lt;0.0001 &lt;0.0001 &lt;0.0001</pre>	<0.0001 <0.0004 <0.0001	<pre>&lt;0.0001 &lt;0.0001 &lt;0.0001</pre>	<pre>&lt;0.0001 &lt;0.0001 &lt;0.0001</pre>	<0.0003 <0.0001 <0.0003	<pre>&lt;0.0001 &lt;0.0003 &lt;0.0004</pre>	<pre>&lt;0.003</pre> <0.00005<0.00005	<0.0003 <0.00005 <0.003	<0.00005<0.0005<0.0005<	.0.00005 <0.00005 :0.00005 <0.00005	< 0.00005 < 0.00005	
	TCE	0.01 <0.0006 <0.0002	<pre>&lt;0.0002 0.02 0.03 0.004</pre>	0.008 0.008 0.04	0.02 0.006 0.004	0.006 0.04 0.01	0.004 0.4 0.4	0.008 0.4 0.4	0.02 0.004 2	0.04 0.008 0.8	0.2 0.08 3	0.04 0.004 0.02 0.1	0.01 0.004	0120016
	CC14	<0.00006 <0.00006 <0.00003	<0.00003 <0.00003 <0.00003	<0.00003 <0.00006 <0.00003	<0.00003 <0.00003 <0.00003	<0.00002 <0.00002 <0.00002	<0.00005 <0.00002 <0.00008	<0.00002 <0.00005 <0.00008	<0.0005 <0.00001 <0.00001	<0.00005 <0.00001 <0.0005	<0.0001 <0.00001 <0.0001	<pre>&lt;0.00001 &lt;0.00001 &lt;0.00001 0.00001 0.006</pre>	<0.0001 <0.00001	tu D. Abranovic
	TCB	0.2 0.02 0.02	<0.0001 0.2 0.001	0.002 0.001 0.002	0.004 0.001 0.001	0.000.0	0.002 0.008 <0.0002	0.002 0.4 10	0.02 0.009 2	0.009 0.002 2	0.2 0.002 0.04	0.01 0.0004 0.01 0.1	0.006 0.0008	Heal cod
T I	1,2-0CA ppm	<0.05 <0.05 <0.05	<0.02 <0.02 <0.02	60.02 60.05 60.05	0.02 0.02 0.02	<pre>&lt;0.02 &lt;0.02 &lt;0.02</pre>	<pre>&lt;0.02 &lt;0.02 &lt;0.02 </pre>	<0.02 <0.02 <0.8	<0.2 <0.008 <0.008	<0.02 <0.008 <0.02	<0.08 <0.008 <0.08	0.008 0.008 0.008 0.08	<0.08	
), CALIFORNIA	CHC13	<0.0006<0.0006<0.0006<0.0004	<pre>&lt;0.0004 &lt;0.0004 &lt;0.0004</pre>	0.0004 0.0006 0.0006	0.0004 0.0004 0.0004	<0.0002 <0.0002 <0.0002	<0.0004 <0.0002 <0.0004	<pre>&lt;0.0002 &lt;0.0004 &lt;0.0008</pre>	<pre>&lt;0.004 &lt;0.0001 &lt;0.0001</pre>	<pre>&lt;0.0004 &lt;0.0001 &lt;0.0004</pre>	<0.001 <0.0001 <0.0001	0.0001 0.0001 0.0001 0.0001	0.001 0.0001	
CORPORATION/SACRAMENTO,	CHC12 PPm	0.08	0.02 0.02 0.02	6.02 60.06 60.02	0.02 0.02 0.02	0.02 0.02 0.02	60.03 (0.02 (0.03	0.05 0.08 0.08	.0.0 .00.0 .00.0	<0.03 <0.01 <0.9	00.1 00.01 00.1	6.0 6.0 1.0 1.0	.0.1 .0.01	
8710N/S	Depth Date	12/09 12/09 12/09	12/09 12/09 12/09	12/09 12/09 12/09	12/09 12/09 12/09	12/10 12/10 12/10	12/10 12/10 12/10	12/10 12/10 12/10	12/10 12/11 12/11	12/11 12/11 12/11	12/11 12/11 12/11	9999 1110 1111	12/11	
ROGR	Uept	{ 1 !	÷.	က်တော်ကာ ကြောက်တာ	ກິ່ນລົ	ពិភិព	င်- ဟိုင်္	÷១៦	Ť <b>Ť</b>	ကော် ကို တိ	តិតិត ក	ច្ <b>គី</b> ចំដឹ	ֈ	
RADIAN CO	a figure 3	VC-8-1 VC-4-1 VC-4-2	901-4-4 90-2-3 9627-691	2428-69P 3529-69L 3630A-69L	S6308~e™ S631~690. S632~690.	3633~53P 3634~22L 3635~22L	56.86-221 96.87:22P 86.38-221	9639-88 30-40-81 30-41-81	S6-12 - 8P S6-138P UC - 27	5644-81 5645-81 5646-81	55-421 56-18 - 421 56-19-43	5555-381	5658 981 5657 - 981	Notations

Notations: I interference with adjacent peaks NA not analyzed

Analyzed by D. Abranovic

Checked by S. Cherba

Proofed by L. Laplander

CH Ppm	<5, 800 <5, 800 <5, 800	<5, 800 <5, 800 <5, 800	<5,800 <5,800 <5,800	<5, 800 <5, 800 <5, 800	<5, 100 <5, 100 <5, 100	<5,100 <5,100 <5,100	<5, 100 <5, 100 <5, 100	<5, 100 <5, 400 <5, 400	<5, 400<5, 400<5, 400	<5, 400<5, 400<5, 400	<5, 400 <5, 400 <5, 400 <5, 400	<5, 400 <5, 400 <5, 400
N2 Ppm	840,000 790,000 810,000	800,000 790,000 840,000	870,000 850,000 770,000	770,000 870,000 820,000	780,000 790,000 800,000	840, 000 680, 000 850, 000	740,000 780,000 780,000	750,000 780,000 730,000	750, 000 870, 000 800, 000	870,000 890,000 870,000	840,000 780,000 850,000	800,000 840,000 840,000
02 Ppm	78,000 160,000 160,000	190,000 160,000 200,000	140,000 58,000 140,000	160,000 78,000 190,000	160,000 72,000 75,000	69,000 150,000 45,000	170,000 110,000 94,000	160,000 160,000 170,000	100,000 200,000 42,000	180, 000 150, 000 190, 000	170,000 120,000 86,000	176,000 170,000 200,000
O 를	338	600 700 500	900 000 000 000	222	222	800 50 700	222	100 500 500	888	000 200 200	900 500 700	300 <b>400</b> <b>5</b> 00
002 ppm	11,000 4,200 4,700	⊸ល់ ភូស	2,800 12,000 5,700	4,100 9,700 19,000	1,100 11,600 9,100	1,800 550 1,700	<2,200 12,000 10,000	1,100 740 2,500	12,000 1,800 15,800	ටු වේ ගේ ටු වේ ගේ	ភសិសិ ឃុំលំ សំពុំលំ	្នុក្ស ភេ <b>ភ្</b> ស
Date	12/09 11,0 12/09 4,0 12/09 4,7	12/09 1,60 12/09 5,70 12/09 (2,50	12/09 2,80 12/09 12,00 12/09 5,70	12/09 4,10 12/09 9,70 12/09 19,00	12/10 11,00 12/10 11,00 12/10 9,10	12/10 1,80 12/10 550 12/10 1,70	12/10 <2,20 12/10 12,00 12/10 10,00	12/10 1,10 12/11 746 12/11 2,50	12/11 12,00 12/11 1,90 12/11 15,00	12/11 10,00 12/11 6,90 12/11 9,50		12/11 (1,90 12/11 (1,40 12/11 2,00
	= 4 4	2/09 1, 2/09 5, 2/09 (2,	u ជីល	2/03 2/03 2/03	2/10 2/10 2/10	2/10 2/10 2/10		- N		ည်သွှဲက် ၂၂၂	9999 11999 11999	

Analyzed by D. Abranovic

Checked by S. Charba

Motations: 1 interference with adjacent peaks NH not analyzed

Tracer Research Corporation

Virugi Uniorade Ppa	20.05 20.05 40.02	0.0 0.0 0.0 0.0 0.0	97.0 97.0 97.0	0 m m 1 m m	60.03 60.03 60.03	0.03 0.03 0.03 0.03
Been de come	0.00 0.00 0.00	0.00 0.00 0.00	6.61 6.1	0.1 0.6 1	60.0 60.0 60.1	60.01 60.11 60.11
PCE PPM	0.002 0.004 0.00004	<0.00004 0.003 <0.00004	<pre></pre>	0.009 4 0.1	0.0009 0.002 <0.0003	<pre>&lt;0.00003 0.02 0.03 0.03 0.09</pre>
EDB	<ul><li>(1), 000008</li><li>(0), 000008</li><li>(0), 000008</li></ul>	.0.00008 < 0.00008 < 0.00008 < 0.00008	<pre>&lt;0.00008 &lt;0.00004 &lt;0.0008 &lt;0.0004 &lt;0.0008 &lt;0.0004</pre>	<0.003 <0.003 <0.0006	<0.00006 <0.00006 <0.0006	<0.00006 <0.00006 <0.0006 <0.0006 <0.0006 <0.0006
ent Box	0.00 0.00 0.00	0.008 0.04 0.004	0.004	0.08 5 0.2	0.009 0.6 0.8	0.1 1.1 6
CC1-4	<0.00m2 0.00m2 <0.00m2	<0.00002 <0.00002 <0.00002	<pre>&lt;0.00002 &lt;0.0002 &lt;0.0002</pre>	<0.0002 0.01 <0.00002	<pre>&lt;0.00002 &lt;0.00002 &lt;0.0002</pre>	<pre>&lt;0.00002 &lt;0.0002 &lt;0.0002 &lt;0.0002 &lt;0.0002</pre>
TCA PPm	0.002 0.0008 0.01	0.0008 0.2 0.002	0.002	2 0.08 0.002	0.02 0.001 0.008	0.01 0.06 0.9 0.8
1,2-CCE ppm	6.01 6.01 6.01	6.0.0 0.01 0.01	6.01 6.01 6.1	<0.1 <0.2 <0.008	<0.008 <0.008 <0.08	<0.008 <0.08 <0.08 <0.08
CHC13 ppm	0.0002 0.0002 0.0002	<pre>&lt;0.0002 &lt;0.0002 &lt;0.0002 &lt;0.0002</pre>	<0.0002 <0.002 <0.002	<0.002 0.04 0.001	<0.0002<0.0002<0.0002<0.002	<pre>&lt;0.002 &lt;0.002 &lt;0.002 &lt;0.002 &lt;0.002</pre>
CH2C12 ppm	0.05 0.02 0.02	<0.02 <0.02 <0.02	<0.02 <0.2 <0.2	<0.2 1	0.008 0.009 0.09	<0.009 <0.09 <0.09 <0.09
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n expedien o	######################################	S061-04L S662-04L S663-24L	5-9-00 5-9-00 5-9-00	VII e - 1 Siste 4 - 1 SP Siste 5 - 1 SP	ए. NS-1 एष-न एष-5	9-MO 9-MO 0M-80 0M-7

**Tracer Research Corporation** 

Modestones: 1 interference with adjacent passka Net mot analysed

Analyzad by A. Morsoovic

Chacked by S. Charto

Provided by S. Charba

# RADIAN CORPORATION/SACRAMENTO, CALIFORNIA

1	!						
CHA Figg	<5,800 <5,800 <5,800	<5,800 <5,800 <5,800	<5,800 <5,800 <5,800	<5,800 19,000 45,000	5, 300 5, 300 6, 300 6, 300	<5,300 <5,300 <5,300	<5, 300
7.2 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0	750,000 730,000 710,000	690,000 760,000 730,000	720,000 750,000 770,000	770,000 650,000 620,000	750, 060 760, 060 750, 060	690,000 760,000 780,000	770,000
0.2 ppm	190,000 190,000 180,000	160,000 69,000 30,000	190,000 150,000 170,000	170,000 44,000 61,000	32,000 110,000 110,000	110,000 94,000 66,000	28 <b>,</b> 000
!							
0.02 ppm	္ . ၁, 200 ၁, 300 ၁၉, 300	12,700 12,000 2,700	970 4,700	9,400 12,000 9,200	10,000 2,200 6,300	1,900 3,500 4,100	S, 000
1 1	<u> </u>	12/14 <2,700 12/14 12,000 12/14 2,700	12/14 970 12/14 4,700 12/14 4,400	12/14 3,400 12/15 12,000 12/12 3,200	12/15 10,000 12/15 2,200 12/15 6,300	12/15 1,900 12/15 3,500 12/15 4,100	12/15 5,000
ا ا ا ا							

Tracer Research Corporation

Analyzed by D. Abranovic

Checked by S. Cherba

I infertorence outboadmanent peaks. Mitted analyzed

Hed of nouse

APPENDIX B

Raw Analytical Results (ug/l)

JOD EADIRN (SAREMENTS CA)

THACER MESEARCH CORPORATION

			µg/1	area	area	area	g/area	mean	2,002	100.	3000		K. 0508		Sac. X		100.									
	5.7	TCA	5	7956	2 1500000 6	1294	۲٬۰۵۰۶	µg/1	c.000.7	.001	2.000.	1,0009	25000 2. 0008	250500 6,0008	6,0008	2.0005	100.									
``	3	1		11477956	2 150	31503294	3,35×10-17	area	<50000	20005	< 5000	55000	£50000	250300	0 ch027	6.50000	€0000 €	1657231								
			µg/1	area	area	area	g/area	mean	4.2	4.06	4.06	2.06	k.06	4000	900		4.06									
,	5.33	J DKA	200	32	156	72	51-01	μg/l	6.2	7.06	4.06	2.06	6.06	6.06	2002	6.06)	2,06								,	,
`	7	77		1 4/3032	2 395256	3393072	4.99×10-15	area	<50000	C25000	22500V	625634	23500U	225000	6.002 625000	c 25030	<25000	431871								
			µg/1	area	area	area	q/area	mean	<.005	4.002	£00.7	6.000	4.003	Carry	4,002	1	CO0.7									
ŗ	5.03	CHCI	, 0/	0005101	886.083	805	1.03×10-16	µg/1	4.005	4,002	6.003	C00'>	<.002		200.2	200.2	C00.2									
	2			1 1019	2 886	3 1015805	1.03	area	< 50000	< 50008	cees>	50000	2 5000J	250002	250000	50000	6 50000	5015811								
/a			µg/1	area	area	area	g/area	mean	6.2		117	117	لا: /	T			1.7									
Page	2.67	CH, C.1.	200	424464	101	374	4.95×10-14	µg/1	4.2	1.5	7.7	_	117	107	1.7	7.7										
,		0		1 409	240842	3 398374	4.95	area	750000	2000 7.5000	UC665 2 0006 11/1	2000 250000	453000	2000 250000	< 50000		L	433540								
Date (2 /2 /87	,		ر .	E	č		sheet	amt	0061 /		2000	3 2000							├-	-		-				
Date/			standard conc	response from	Oul injection	,	or this	time	hpc, A	_	<del>                                     </del>		<del> </del>	-	1		<u> </u>		-		-	-	_	_		
			stand	16800	i InO/	<u> </u>	RFs for	sample	N. Comba	In Camp de	N. 1-6. A.	Duck Olik	Sign 14P 1	70/1-1-95	16-7-141 5.5	16-7-146 56	un court	3								

interference with adjacent peaks not analysed estimated peak area response factor **\*** - ₹ : Netations:

Analysed by John

TRACER RESEARCH CORPORATION

<del></del>			μg/1	area	area	area	g/area	mean	4.00%	100,	7001	100.	100/		75.00/		4.001									I
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			µg/1	area	агеа	area	g/area	mean	C.007	7.001	190,7	100,2	4.001		4.001		6.001								gessa	
	7.82	£08		40260G	7117	1092	10-17			6.001	700.7	6.00/	4.001	6.001	7.001	4.001	10017								the Tang	
	7	13	Q	1 422.	2 4016712	3 4176092	4.83×10-17	area	250000	< 500 0J	< 50006	250010	<b>250000</b>	<50000		250000	450000	4339104							 Analysed by	ed by
			μg/1	area	area	area	g/area	шеап	2.005	C00'>	4.0E	C007	E00.7		4.000		C 00.7								Analy	Checked by
	7.13	766	01	452754	30000001	136	102×10-16	µg/1	10	1		20017	4.007	700.2	600,7	600.2	E00 . 7									l
	1			1 907	2 /00	3 1039136	1.02x	area	250000	0000		550000		250000	S0037	200057	250000	8784761							t peaks	
9/		/"	ng/1	area	area	area	q/area	mean	4.000,7	. 0003	4000	. 2003	4000		,0003		.0003								response factor interference with adjacent peaks	rea
Page	90"	M (:)"	5	2280638	0000046	2321060	8.57×10-18	µg/1	-			, 0003	1 •	7000	.0003		,0003								response factor interference wit	analysed mated peak arga
	1	44		1 64 2	2 24	0		arca	OS	\$ 3000			2000 90000	\$500 E	80000E	79703	30000E	_							respons	not analysestimated
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			standard	mora from	10 ul injection		RFs for	sample	N 100g	12. Danol.	N. Her. A	motor (-1.	1-14P	13-1-14P 6		25/11/20	in samol	T	7						Not	1

TRACER RESEARCH CORPORATION JOD PADIAN (SACRE MENT )

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) )		3 158	90247851	area	3		агеа	3		area	3		агеа
RFs for this	s sheet	6.49	6. 44x13-16	g/area			q/area			g/area			g/area
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R I A E Notations:

response factor

interference with adjacent peaks not analysed estimated peak area

Analysed by Land

THACER RESEARCH CORPORATION

Date 12/2/87

Page

	- 1									
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RFs for this sheet	1, (, 5 × 10 16	0		g/area	а		g/area			g/area
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not analysed estimated pook area N E

JOD RADIAN (SACREMENTO

TRACER RESEARCH CORPORATION

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Analysed by

interference with adjacent peaks

response factor

estimated peak area

not analysed

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Notations:

JOD RADIAN (SACREMENTO CA)

TRACER RESEARCH CORPORATION

DATA

JONDENSED

Page

Date 12/2/87

< 37000 /80000 C37000 160000 119/1 area area area g/area mean µg/1 Cor area V/wYL . HINFICE 6,03 6,03 0 area area area µg/1 g/area GENZENE 2.03 6.03 mean 100. 100.2 µg/1 PLE 100.7 100.2 EOB area 4.002 2.003 area 17<u>6</u>7 area area q/area TCE mean 4000 .0003  $CG_{\chi}$  $\mu$ g/1 2.0008 2.0008 area 25 area area g/area 4.06 **1**/64 2.06 420CA mean 2.005 CHCI3 4.002  $\mu$ g/164.01. arca 7 amt inj RFs for this sheet depth standard conc. 7. response from ul injection time 56.5-141 dx1-1-95 sample

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Notations:

interference with adjacent peaks response factor not analysed

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Analysed by Checked by U

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TRACER RESEARCH CORPORATION

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DATA		µg/1	area	area	area	g/area	mean												Analysed by Checked by
						,	µg/1												
CONDENSED			-	2	3		area												peaks
8		µg/1	area	area	area	q/area	mean												ad jacent
Page							µg/1	CHS	7 3300	23200									response factor interference with adjacent peaks not analysed estimated peak area
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Date 12/2/87	' <del></del>			·		sheet	amt	Ł										_	R I R E
)ate		d conc.	e from	ection		thiss		deoth	7	`~	2								Notations:
_		standard	response from	ul injection	1	RFs for	sample	Γ	56-1-14	1h1-C-75									Nota

TRACER RESEARCH CORPORATION

JOD RADIAN (SACREPIENTO, CA)

CONDENSED

Page

Date 13/5/87

area area g/area 12000 area 0  $\mu g/1$ mean 93000  $\mu g/1$ (01 wind. 1.0g Bengue area area area g/area 1901 <.03 mean PCE  $\mu g/1$ 60 6.0002 608 area area area area q/area µg/1 ,009 TRE mean 100017 4722 rg/1 ,02 12A area ~ K30 67 area area area q/area 70.2 NO 1 mean CHCla 19/I 8 CHClz arca Ł amt n] RFs for this sheet depth standard conc. response from ul injection time WW sample と SG-28. FH

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JOD RADIAN (SACREMENTO CA

CONDENSED DATA

THACER RESEARCH CORPORATION

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CA
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RADIAN
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TRACER RESEARCH CORPORATION

6.000 1.000° 0 area g/area  $\mu g/1$ 4.000 mean 425000 6,0004 4000,7 425000 14.0004 70 ug/1 3,11 x 10-17 21617589 1627632 5.87 TCA 135000 1659702 1016324 893418 area area area area g/area µ9/1 4.06 707 70,2 7.00.7 mean 1 X10-15 70.7 20.2 2.0C hg/1 7017 7.8( DCA 457787 ì 200 443 000567 535000 C35000 225000 C2502 7454 area area area q/area area 2.001  $\mu g/1$ 4.00/ c.001 mean 100.2 100.7 100.2 µg/1 0651311 8.47x 10-11 3 1198358 1157689 0 2 5200 4360013 1203830 3834440 < 25000 <25000 area ١ area area area 1.05 g/area 2,05 ug/1 2.05 mean ) 3 44 470 441 4.34x10-15 4,05 2,05 50.7  $\mu g/1$ 1458712 2 454514 28 1453 2000 425000 000562 0000 175900 1631 2000 193331 St4928 715000 481571 area 2000 at the Cool 2000 2000 amt 1n] RFs for this sheet 1648 standard conc. 雅 response from ul injection 1705 time 56-28-M-r tin sample an sample X"-28-146 B sample

Analysed by

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interference with adjacent peaks

response factor

not con ysod estimated peak area

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Notations:

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TRACER RESEARCH CORPORATION

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Date 17/3/67		7007	e from	ection		this	time	01/1	1425	1440	1453	1547	189!	8491	1	1					Notations:	
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JOD RADIAN (SACREMENTO CA)

THACER RESEARCH CORPORATION

150 area area g/areg area mean µg/1 area 7 area area area g/area  $\mu$ g/1 mean **pg/**3 area area area q/area area  $\mu g/1$ mean hg/1 area 1-997 4277 900300 Bres 20.7 <.03 4.03 area 2.03 g/area Page 12 mean BENZENE 7000000 € 5,37× 10 16 2.03 2.03 2.03 4.03 60,2  $\mu$ g/1 po 00077 1453 2000 610000 1547 2000 6100000 2000 4100000 2000 17 0000 6 100000 area 1000 2000 12000 ST. RFs for this sheet 0/6/ 1705 0/1/ 1425 8#91 1631 standard conc response from 10ul injection t ime S6-20-11/4 8 56-20-1488 ansamole sample

Analysed by

Checked by

interference with adjacent peaks

Notations:

response factor

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peak

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not analysed

JOD RADIAN (SACREMENTO CA)

TRACER RESEARCH CORPORATION

Page\_/

			1/1/1/	CHIOK	3013									
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, ,			3 36250H	5094	area	3		area	3		area	3		are
RFs for this		sheet	7.00	7.00 × 10-16	76			g/area			g/area			g/area
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56-28-148/1648	8/9/	opoe	cappi 7 proe	10.2										
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interference with adjacent peaks not analysed estimated peak area response factor R I R

Notations:

Analysed by

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RADIAN (SACREMENTO, CA	Page	46	60	264000	799089	793782	98315	3.31× 10-10	µg/1	١	)	733001	23300	94000	32000	080887								e factor
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Notations:

interference with adjacent peaks response factor RF I NA E

not analysed estimated peak area

Analysed by 🥻

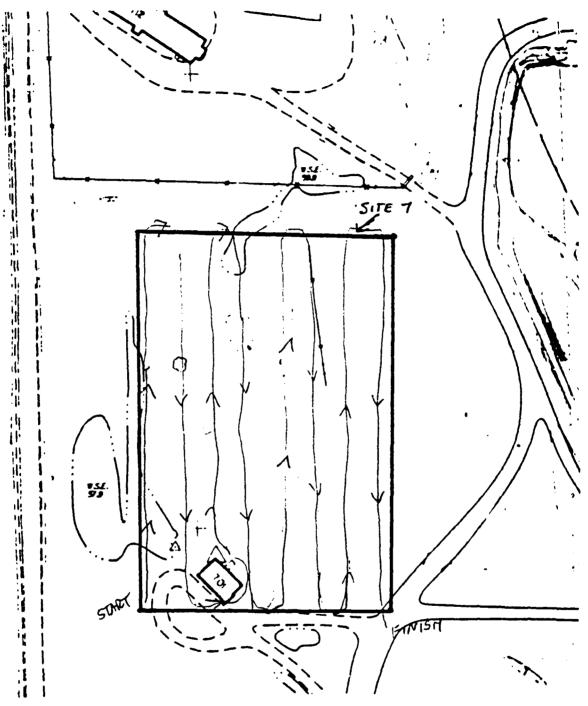
heck

## RADIAN

## APPENDIX C

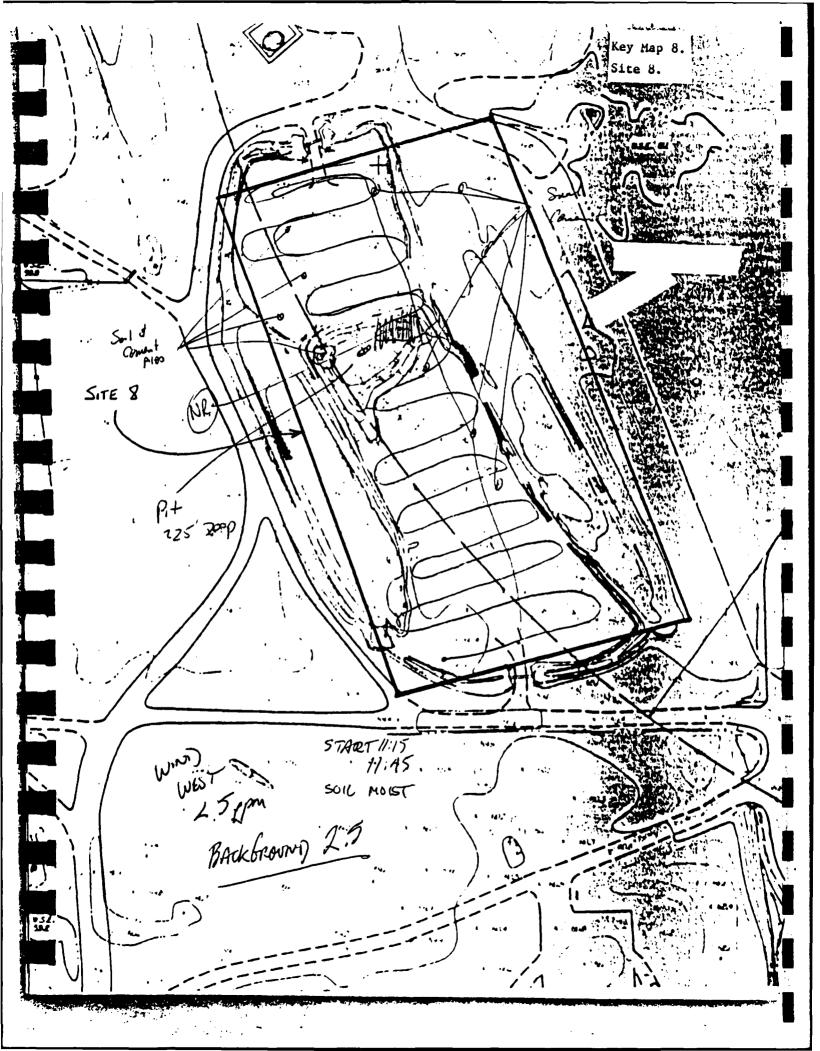
Emission Screening Field Notes, Observations and Maps

Note: This appendix contains field test observation sheets and presents the walking patterns performed during the surface monitoring of landfills Nos. 7, 8, 10, 11, 12, 13, 14, 22, 38, 42, 43, and 69. Surface monitoring was not required for the remediated sites in Area D.

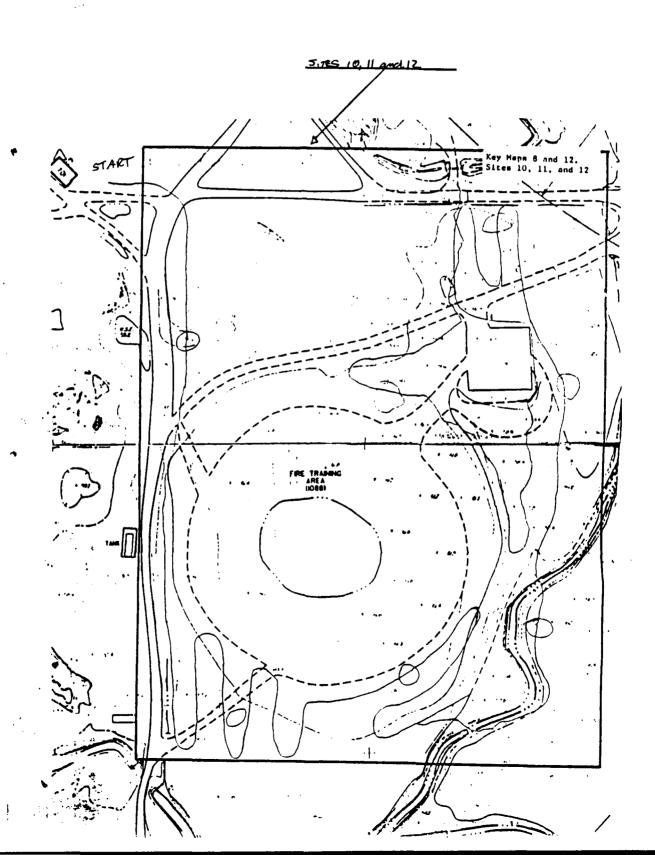


OG45 ARRIVED ON SITE SET UP OVA PRE CALIBRATION - UP AIR - 3 PPM 482 PPM METHANE - 95 PPM

WIND - SOUTH 3-5 MPH
INITIAL & ACKGEOUND READING - 4 PPM
FINAL " - 2.5 PPM
NO READINGS GREATUR THAN 4 PPM; KINISH 10.37



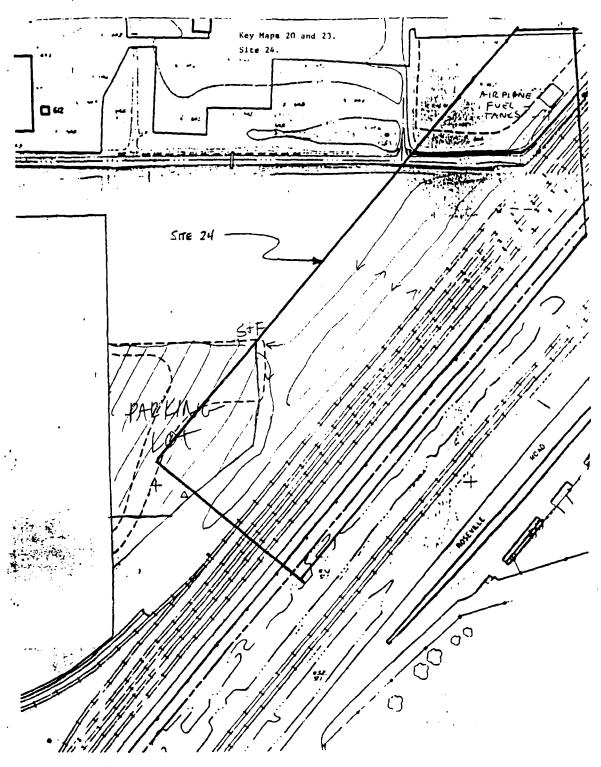
START 10 40
INITIAL BACKGROUND 2.5 PPM
FINAL " 2.5 PPM
NO READINGS OVER 3 PPM
SOIL MOIST



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START: 1350
RACK OFFINISH 1420
BACKGEOUND 3.0

SOIL MOIST
NO READINGS ABOVE 35



START-12:50

BACKGROUPD 3:0 PPM

FINISH-13:20

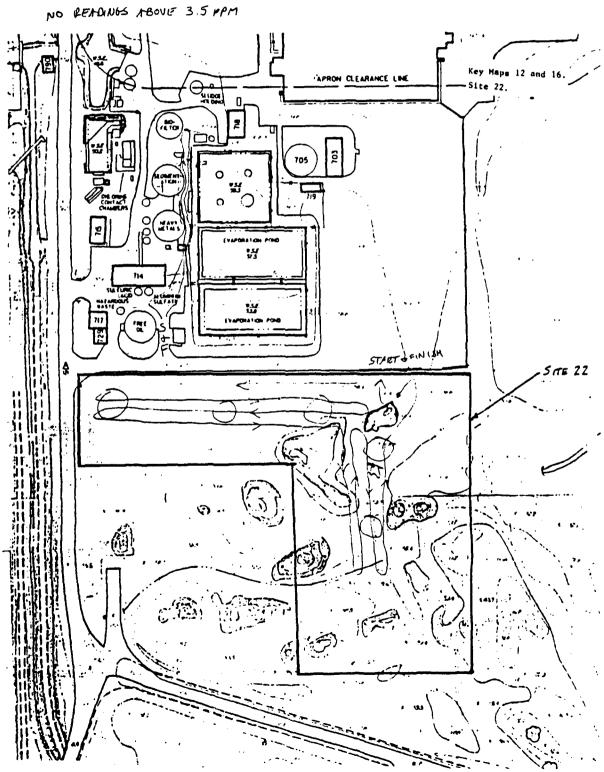
BACKGROUND 3:0 PPM

SATE 22 SOIL MOIST, LUTS OF STANDING WATER AND MUD

SITE 42 MOSTLY PAVED OR UNDER EVAPORATION PONOS, A FEW ORANGE + DIRT AREAS

START 1320

BACKOROUND 3 O PPH
FINISH
BACKOROUND 3.0 PPH
BACKOROUND 3.0 PPH
BACKOROUND 3.0 PPH
NO REMDINGS OVER 3 5 PPM
SOIL MOIST



FINAL CALIBRATION: 1500 STHUT 1425 EINISH 1455 UP AIR - 3 PPM PW-100 98.2 PPM - 90 PPM BACKERONO 30 PAR MOST PANED, 27 GRAVER AREAS SEE 38 -NO READINGS OUCH 35 PPM Key Maps 17, 18, 19, and 20. STACET × 423 ₹.r AE' STREET د. .....

gg m**a**t

STHET 12-04

BACKGROUND 25 PPM

FINGH 1230

BACCGROUND 25 PPM

NO READINGS ABOVE 3 PFM SOIL-MOIST

SITE 43, START 12:36 SEE MAP

SACKGROUND 3.0 PPM ON PREVIOUS

FINISH 1247 PAGE

BACKGROUND 3.0 PPM

NO REMOINDS AROVE 4 PPM

SOIL MOIST

SITES 13 AND 14 0.00 O 0 FRE TRANSIG

Site: Chause varor analyzer (1.1.1.4 quality control curck

Calibracion Species: M

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MULTIPOINT CALIBRATION DATA

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error or correlation coefficient. 1. Acceptable if drift <201.

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RF response factor I interference with adjacent peaks NA not analysed E estimated peak area

Notations:

Analysed by

JOD PADIAN (SACREMENTO, CA,

Date 12/4/87

THACER RESEARCH CORPORATION

CONPENSED DATA

area area area

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g/area เมยลเม area area area area g/area  $\mu$ g/1 mean  $\mu$ g/1 area area area area  $\mu$ g/1 q/area mean µg/1 area area area area q/area **1/6**d mean 0007 20000 940000 21300 C1300 940000 41300 CHY 98000 C1300 ng/1 240000 620000 750000 area amt In ) RFs for this sheet depth 5.25 standard conc. response from ul injection t ime 26-7-22 JH-7-95 781-7-75 56-3-14P S6-5-13P sample 72-8-95

Notations:

interference with adjacent peaks not analysed estrinated peak orta response factor

Analysed by

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TRACER RESEARCH CORPORATION

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	5,26	1, 2 DCA	S	43732 43570	463132	474447	1 X 10-15	µg/1	1	1	6.05	2.05	2.05	12	6.05	4.1	2.05	7.7	2.05	7:7	7:5	7.7	7.7		17	73	The True	
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(	Page_ 	CHCI,	300	29	145	88	7 24 > 10-15	ug/1		,	2.05	2.05	7 1	村	7.05	6.1	2.05	1.7	2,05	L	7.7	×	6		0/	10	e factor	rence wit
7		9		1 459129	2475755	1479688	42	area		Consta	2000 : 25000	725006	_				4250d	225000	25500	_		17339	210097	457069	943 64G	130384	response	interfe
,	Date 19/4/8/					<u></u> -	choot	amt	13	C601	<del>-</del> -	2000	2000	0,00	*		ρ <b>να τ</b>	080/	2000	1003	}	+		T	001		Į.	<del></del> :
	Date 12		Conc	e compa		בררוסוו	1 4 4	Line	168		900	414	120	. l • -	· 7 · —	101	151	1137	(7)	13.07	1321	1337	1470	11/1	<del>.</del>	1	1	Notations:
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interference with adjacent peaks not analysed estimated peak area Notations:

TRACER RESEARCH CORPORATION

JOD RADIAN (SACREMENTO CA)

			µg/1	area	area	агеа	g/area	шеап			v. 900	, 000	4.000	1.00		રેં ?ેં		0		36.		; o		,	(1)		
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			µg/1	area	area	area	g/area	mean			700.7	$\neg \tau$	100.2	4.001		100.7		100.2		74.002		74.82			16.24		
	7.76	96	0	362	1111	929	110-17	µg/1			7.001	4.001	7.001	600.2	4.001	C90.7	100.2	2.007	7.001	4.002	4.002	4.00%	c.000		2.02	40.7	1
	7	608	90	1 2795798	2 3524467	3 2413676	276 X10-17	area			25500	cosser	coses	225000	225000	225000	225000	725000	235040	COSCO	22500	000527	ast7	273702	C005E7	62520	<
			µg/1	area	area	area	g/area	mean			100.7	7.00.7	100.7	1007	_	100.7		1,02		1,006		>,2	/		12		
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Analysed by Jose

Checked by

interference with adjacent peaks not analysed

response factor

RF \_

Notations:

JOD RADIAN (SACREMENTU (A)

TRACER RESEARCH CORPORATION

Page 1

300 RADIAN (SACPEMENTO CA)

THACER RESEARCH CORPORATION

Page Date 12/4/87

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JOD RADIAN (SACREMENTO CA)

TRACER RESEARCH CORPORATION

		µg/1	area	area	area	g/area	mean	)	613	C( % )	2130	k/3,		7417.		×13		(1)		¥//:			Sons		4130	
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Page_	60	26400	17/12/8	16.3	689	3.22x 10-11	µg/1	ì	1600	£2390c	1	1 7	41600	0017	3700	17000	000%/	4100	2900	42000	42200		34000	34000	6717	response factor
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Date 12/4/87		d conc.	e from	ect ion		this	t ime	600	836	915	935	10/		<del></del> -	7	<u>- L</u>	,	1,343	1308	1337	1347	1/5/			1758	
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response factor \* - \$ E

Notations:

interference with adjacent peaks not analysed estimated peak area

Analysed by Holla

300 RADIAN (SACREMENTO, CA)

TRACER RESEARCH CORPORATION

Page 22

				CH. Cl.		2	CHCI,		/,	12 DCA		724	H	
Standar	standard conc.				ug/1			μg/1			µg/1			[/brl
dog an .	monde from		_		area	-		area	1		агеа	-		are
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PFe for	this	sheet		\ \ \	Q/area			q/area			g/area			g/are
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ansand	+-		2000 625000	2.05	\ .	73200	2.001	6.001	735000	2.05	4.05	30000€		
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JOD RADIAN (SACREMENTO, CA)

TRACER RESEARCH CORPORATION

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standard conc			+ 122	1/00		45	1/gu			1/64			1/brt
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ne julianiection		2		area	2		вгев	2		area	2		area
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RFs for this	sheet			q/area			q/area			g/area			g/area
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1	13	+ 3			20	7.001	2.001	625000	4.001	100.7	625000	6.0003	2,000
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	R R	not ana estimat	not analysed estimated peak area	rea			Checked by	d by		6	1		
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JOD RADIAN (SACREMENTO CA)

Page 2C

THACEN MESEANCH COMPONATION

COMPONATION

	. — <u>—</u>	170	BEN ZENE										
standard conc.				µg/1			µg/1			μg/1			/bd/
response from		_		area	1		area	1		area	1		area
ul injection		2		area	2		area	2		area	2		are
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RFs for this sh	sheet			g/area		·	g/area			g/area			g/ares
t i me	amt in j	area	µg/1	шеап	area	μg/1	шеап	area	µg/1	mean	area	µg/1	теап
2 1854	3000	3000 410 0000	6,2	70.7									
Notations:	8 - 8 E	response facinterference not analysed	response factor interference with a not analysed estimated peak area	response factor interference with adjacent not analysed estimated neak area	t peaks		Analysed by Checked by	ed by	The same	Jan	\		
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300 KADIAN (SACREMENTO, CA)

TRACER RESEARCH CONFORATION

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CONDENSED DATH

	,		-											ļ
standard conc	d conc.				µg/1			µg/1			µg/1			µg/1
response from	e from		1		area	1		area	1		area	1		area
lui lu	ul injection		2		area	2		area	2		area	2		area
		·	3		area	3		area	3		area	3		area
RFs for	this	sheet			g/area			q/area			g/area			g/area
sample	time	amt in)	area	µg/1	шеви	area	μg/1	mean	area	µg/1	mean	area	µg/1	mean
	Septh		C41.43	C NCL	1,0 OCA	TCA	CCIY	TCE	€08	PCE	3M32 N38	30'807H?	£02	0
	,			)										
72-6-95	7,		1.7	4.000	1.2	400.	6.0002	,00	6,002	, 4	40.7	7,	11000	200,00
72-01-75	, 9		3.0	CO.	1.2		2,000,2	, 2	20012	(n)	40,2	.2	16000	00041
26-11-72	7.5		9/	20.7	17	100	6,002	8	20.2	/	7.7	h	60060	2000 C
56-12-71	\$		6	4.004	7.7		2,0005	•	<,003	,3	80.2	4.2	20000	2000/
56-13-70	2,		3 ک	2.002	117		7000.		6.00û	2,0005	, ,	2.08	1300	30008
301-11-75	, 7		2.05	100.7	2.03		9000.		4.0005		L. UZ	4.04	6860	300,00
SG-15-10P	,9		1.7	2.002	2.1	2,0008	6,0002	2,002		C.002 6,0005	2.0 K	6.08	2200	26000
SG-16-10P	,9		117	4.002	1.7	2.0008	6.000.7	7.00.7	6.007	2,0005	40,2	30.2	2600	28008
411-11P	, 7		2.05	100.7	507	6.0004	6.0001	2.0008	2.0005	6.000.7	6.02	7.04	17000	idoane
														`
		RF	respons	response factor				•		1				

RF response factor
Notations: I interference with adjacent peaks
NA not analysed
E estimated peak area

Analysed by John 12

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TRACER RESEARCH CONFORATION

		µg/1	area	area	area	g/area	µg/l mean																]
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		ug/1	area	area	area	q/area	mean															Taugemen	D
							μg/1		_													1,	( )
			1	2	3		area															Analysed by Mahi	od by
MACA		µg/1	area	area	area	q/area	mean															Analys	Checked by
CONDENSED DATA							µg/1																1
CONDE			1	2	3		area																t peaks
रु		ng/1	area	area	area	q/area	mean																interference with adjacent not analysed estimated peak area
Page							1/6п	CHU	0297	1300	2300	2670	4670	2670	0197	4670	01.77					response factor	interference with a not analysed estimated <u>p</u> eak <u>are</u> a
~			1	2	3		arca	γ,	Good				92000			Rassau	600076					respons	interference not analysed estimated pe
18/8/	'			<del></del>		sheet	amt in j															RF	¥
Date 12/5/87		conc	1	ction		this st		deoth	1,4	, 9	7.5'	Ò	18	17	, 5	`,	, ,	2					Notations:
ບ		standard	morp erron	nl injection		RFs for	٥		72-6-75	22-11-95	71-11-95	16-61-75	5/2-13-70	N-14-10p	SK-75-10P	S/2-11-10P	S6-17-11P						Nota

JODERADIAN (SALREMENTO CA)

TRACER RESEARCH CORPORATION

_		µg/]	aree	area	area	g/aree	mean		2.00	00.	1001	30.		9		٨٠٠٥		\ \ \ \ \		3			00 >		
5.82	TCA		609	1585543	40	3.08×10-17	µg/1		4.0004	,000	, xx ,	400.	,000	×	5.	C. 00	6.00g	i	.03	,002	-002		,002	100.	
29	7		1 1653602	2 1585	3 1638140	3,08,	area			€ £0000 E	83000	139663	145587	249.2566	13/8:091	2500¢	C25000	5387//	5/1196	70505	70000	1378550	Sooco	80000E	
	`	µg/1	area	area	area	g/area	теап		2017	20,2		100/		10.2		121		4:2		/			16.05		
7 25	2 DCA	200	488745	469321	229	28×10-15	µg/1		2,05	2.05	2.05	1.7	1.2	7.7	۲ (	62	17	4.2		4.15	1.2		6.1	2.05	1
٧			1 483	2 469	3 445229	4.28	area		arst7	109527	000567	000567	OPESC7	435000	625000	parsez	725.969	COOS C 7	625000	<2500J	mase >	429424	435000	425000	•
	`	µg/1	area	area	area	q/area	теап		1.00.2	4.00	100,2	1 4.002		1,02	/	12.02	/	12.00%	/	12.003	/		100.7		
75	CHCis	c)	1170125	<i>4</i> <b>≠</b> 0	8 99	8.53-X 10-17	µg/1		100,2	<.001	€.∞/	2.902	20077	.02	£.02	40.2	6.02	L.004	4.004	2.002	2.002		Z. W. Z	6.001	
4.95	υ	/	1 //20	2 11870 44	3 116 0663	8.53	area		000567	42500	125000	225000	C25000	200000C	0005cx	p005C7	22500C	735000	C250d0	C68567	C55230	1070486	225000	<25300	
1/a	7	µg/1	area	area	area	g/area	mean		2.05	2.05	2.05			動	/ 30	9/\		6		1.5.			16.05		
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13/5/						sheet	amt	COOL	2000	2000	2000	Coci	500/		<del></del>	50	1	L	500	1,063	<del>                                     </del>		coct	2000	\
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Notations:

interference with adjacent peaks not analysed estimated peak area response factor R I R

Checked by <sup>C</sup>

Analysed by Charles

Page

TRACER RESEARCH CORPORATION

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			лg/1	area	area	area	g/area	mean		₹.0008		2.0008	4,002		1500.2		75.05		6.003		70017			Surp. >		
171		EDE		3000000 E	000 E	320	34×10-17	µg/1			c. 0008	2,0008 6	€00.2	<.007	c. 002	2.03 /	2.03	7.0.7	6.003	6.003	4.000	4.000		2.00.7	2.000g	1
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, ,	107	CE	70	720	245	287	10-17	µg/1		7.0008	2.000	Z.0008	.07	90.	7.		. 2	7	7	12	.005	200		-600.	,000	
۲	7	H		1 1517120	2 1523 542	3 1510287	6.59×10"	area		275000	625000	000557	4.0402/1043353	7/0988	379988	154089	1194.953	3/47069	1491485	1633 899	70000F	70000	11.5888.0	35000E	68/92	
47	,	`	µg/1	area	area	area	g/area	mean		1.000.7	2000		4.0642/		6.000	,	14,002	/	12.0005	,	1.0007			7,000		
Page	خاخ	cely	7	548+	244	078	9,77×10-18	µg/1		1.0001	2000.	5000.	4.0002	4.0002	2.0007	<00.7	500'7	4.002	2,0005	2,0005	. 0007	10000		9000.		factor
(	2.9%	ט		1 2084845	2 2066 244	1	1	area		225036	300	103,230	_	_		DP0577	235000	-	25000	c3500	7020CF	1400 70000E	172627	6 2000 E		rotael concess.
3/8/	\ <u>_</u>						sheet	amt inj	ceo,	3000	2000	2000	1000	1000		_	55	00/	52	_	翻	1400	5	2001		10
Date (2)/5	•		conc.	from	ection		this sh	Lime	6/1	125		Γ				$\overline{}$	Ι.	1129	7021	/20/	****	1551	13.37	1438	1452	
_			standard	morj asuousa t	1911 injection	· · · · · · · · · · · · · · · · · · ·	RFs for	sample	N. 66.4	N. black	THE TANK	nut-120	1		10-11 6	77-01-95	56-11-72 75	26-11-7/15	871-01-75	376-21.95	S. 15 W. 2	56-13-70 y	ST.V	+d(1/-/1/-95	401-H-95	

Checked by

interference with adjacent peaks not analysed

estimated peak area

JOD RADIAN (SACPEMENTO CA)

TRACER RESEARCH CORPORATION

7 Page

	µg/1	area	area	aree	g/area	mean			}											1				
						µg/1																		
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	µg/1		area	area	g/area	mean		2.03	6.03	20.2	10.2		40,2	/	12.4	/	80.2		12.04			10.07		
BENJENE	500	130000000/	12613571	11316779	4.0C×10-16	µg/1		60.7	20.2	6.03	40.2	40.7	40.7	6.4	8.7	4.7	80.2	80.2	40.2	40.7		40'7	2.07	
BEN	5	1 /30	177/2	11.31	4.06	area		(SA)7	C100000	0000017 cooc	1000 6100000	1000 6100000	1000/10000	COLOUT	0001017	0000017	0000017	CCCOPIZ	1000 6130001	1000 4 10000	10401600	210000d	1452 2000 6 10000	
					sheet	amt inj	1000	2000	2000	cooc	0001	C001	Ce 01	001	50	604	530	ces	0001	1000		0001	2000	
	conc.	from	ection		this s	time	612	229	735	208	658	727	1009	5001	HII	1129	1206	1221	継	1321	704/	1438	45H	
	standard conc	response from	// ul injection	<b>S</b>	RFs for	sample	N. Wank	White	aircemple					5670-16	25-11-12	56-11-11.25	_	8-12-21-95	56-13-16-4 2'		Sto	4		

Notations:

interference with adjacent peaks not analysed estimated peak area response factor RF I NA E

Analysed by (LC)

TRACER RESEARCH CORPORATION

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Standard conc		, 0	25	µg/1			1/6/1			µg/1			µg/]
moral esconser	E	1 324	7878700	area			area			area	-		are
northead in the tron			89/1	area	2		area	2		area	2	į	are
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RFs for this	sheet	751	7/ N/ X/ 2/	Q/area			q/area			g/area			g/ares
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1	000/ 7												
the	_	2000 2100015	4.04	4.04									
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3061 /8 1/-11-75			4.2	12.2									
1201/8 12-01-25	_	£10000	6.2	/									
56-13-702 130	0001 90	1306, 1000 2103000		12.08									
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7	_	0200017	4.08	10.2									
Į	2 200	2000 6100000	40.2	$\searrow$									
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RF I Notations:

interference with adjacent peaks response factor

not analysed estimated peak area

Analysed by John

CAS JOD RADIAN ISACKEMENTO

TRACER RESEARCH CORPORATION

Date 12/5/

Page

g/area 6227 area area area 4670 60,0 197 **J**g/1 667 6.6 60 77 mean 6/009 6673 0297 62000 5670 1300 97 463 290112 ng/1 1300 CC 27 2.68x 15" 0530 18800 12657 1225000 5 COUSE 2311.977 90000 C25000 483000 2500141 50000 E 125000 1489301 940000 235000 1225000 425000 coest > 920 000 625000 910000 12500 area 190000 9,000 area area area g/area ug/1 Cas 00 12500 mean CO3 x 10-119 22000 4770672 480006 933857 940000 920003 9 092989 920000 140000 9109337 93000 4773510 480000 000068 1/20088 1000C/ 5813498 | 90003 d 897769 910000 20000 9057/95 920000 8800532 89000 0 000006/1999966  $\mu g/1$ 739200 7231206 738559 721955 904064 133885 < 25000 area 30000 S. 1886 area area g/area 30000 19/1 area 63300 mean 23300 300000 227284530000 1550296 20000 223748529000 00000 2 85 25CS1 110000 000021 13000 24000 A000 112920 15000 1.30× 10-10 17g/ 00768 695047 280468 3 685503 14200 957002 186265 696268 C25000 2316047 251028 991837 27075EC 146112 area 62000 00011 20000 0987 g/area 1300 **1/6**d area mean 6001C 20000 17000 62000 000/9 900// 1300 11000 2860 /5000 µg/1 3.45×10" 1300 780874 26400 76045 867751 CO. 177/7 1505609 1000 490923 860365 583/43 38166 412/2 0001 3/1/894 1437429 62 SOGO 725000 1000 749788 275000 36841 area 1000/ 1000/ 0001 1000 180 100C 2002 30/ 100 V 0001 7000 の別に this sheet 1302 1203 1332 9011 1253 333 1000 1159 0// CCL standard conc response from Nov ul injection 940 726 828 t ime x+6 RFs for 56-10-766 h 972-01-95 He beach Oinson & sample 72-11-95 56-13-70 26-11-16 56-12-12 2-17-75 26-9-11 27-47.75

Analysed by 110%

interference with adjacent peaks

esponse factor

estimated peak area

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Notations:

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THACER MESEARCH CORPORATION

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mortagini I	, ,		агеа	2		area	2		area	2		area
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DEC for this choor			a/area			q/area			g/area	1		g/area
1 1 1	area	uq/1	mean	area	µg/1	mean	area	µg/1	теап	area	µg/1	mean
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155K		7.7	<u>-:</u> ×	crese >	6.00.7	4,003	C 25000	6.1	7:-7	7.35000		
2///	20 62 523	L		C2 5000	6.00.7		CD562	۲۰ ا		225030		
1633	225000	7.7	12.05	coeses	4,002	100.2	C25000	7.7	50.2		2.00g	\$\\\.\\\\\\
5/11		2,05		225000	180.2		<2500g	6.05		c 25000	2,0004	
1.170	0005C7 W	2.05	2.05	paser	100-7	100.7	4.001 Lasaw	2.05	2.05	C253006,3004	4,0004	1.03
_	74417			1344 280			8418			1751375		
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RF		response factor				Analy	Analysed by	de la		ţ		
Notations: I	interf	interference with adjacent	h adjace	nt peaks			* : :		1	ŀ		

Cherin by

interference with adjacent peaks

Notations:

JOD RADIAN (SACREMENTO CA)

THACER RESEARCH CORPORATION

Page of 6

1.30.7 K.00. £.00 4.20 g/area µ9/1 mean 225av 2. aw2 2.0005 225000 C. 0005 5000-7 00025-2,0002 2.25000 15.000 Z 625001.000562 µg/1 RE 2700000 2350th 225000 6.003 4.002 area C. 0005 4.0005 area area g/area 17gH mean 4.0008 (235000) L.1888 625000 6,0005 4,00.2 600.2 oese2 C0007 000567 µg/1 COO. 7 000562 EDB 005C7 2250W area 26.000 8000 area 56.00 area area q/area ug/1 mean 2.0008 2.000, 2 SOSSE KON.2 2.007 4.000K 4.002 600,7 23500 2 000 rg/1 020567 1.0001 225000 C. 0002 C. 25000 72500 25000 1500 746 area 10007 area area q/area area 2 mean 1000 LD 5000 L. 0002 1513 1000 12500 6.0002 1000 12 000262 0001 225006 12.0002 225000/2.0002 1708 2000 Cassoo C.0001 12500 / Cass µg/1 113452 area 1000 2000 1000 3 amt nn, RFs for this sheet 1537 1722 1643 3551 standard conc. nesponse from ul injection t ime 7 401-51-25 S6-16-10P 6' air sengle S6-15-10F 1 sample 56-17/1PC S6-16-10P S6-17-11P

Analysed by Meta Checked by interference with adjacent peaks estimated peak area response factor not analysed ¥ L

Notations:

THACEN MESEANCH CONFORMTION

Date 13/5/47 Page 2

	REN	BENZ ENE										
standard conc.	4	500	ug/1			µg/1			µg/1			µg/1
act of the second	_		area	-		area	1		area	-		area
ul injection	, ,		area	2		area	2		area	2		area
מז זוו לבר זימוו	, ,,		area	~		area	3		area	3		area
DC for this shoot			Q/area			g/area			g/area			g/area
l ime	area	ng/1	mean	area	µg/1	mean	area	µg/1	mean	area	µg/1	шеап
1523	100 2 100000 6.04	4.04	40.2									
		40.0	/									
0000012 0001 \$551.1901-71-75	C10000	40.2	10.0%									
SG-11-10 1/6/3 1/00		40.7										
			(0.7									
6791	2100000	2.07										
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	5CIGILP											
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Analysed by John

interference with adjacent peaks

Notations:

not analysed

response factor

300 PADIAN (SALREMENTS CA)

THACER NESEARCH CORPORATION

Date 2/5/87

Page 2

		/////	JUNA CHINOIDE	0.06									
standard conc.				uq/1			µg/1			μg/1			µg/1
ממושמות המוש		_		9763	-		area	1		area	-		area
response if om		,		area	2		area	2		area	2		area
				area	3		area	3		area	3		area
RFs for this s	sheet			Q/area			g/area			g/area			g/area
t ime	amt	area	µg/1	mean	area	µg/1	mean	area	µg/1	mean	area	µg/1	шеап
1	1	1 1	2.08	12.08									
-	00%/		2.08										
		1000 C10000	80.7	14.08									
SC-16-10P1-1613		C100000											
56-11 611-11-33		COCO 2 1001	80.2	16.04									
6411 9011-11-95		2000/2/0000	40.2										
		2000 215000	40.7	40.7									
+		11/8687											
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	-												
	-												
	-							<u></u>					
Notations:	+	response fact interference	<u>ب</u> ا	or with adjacent	nt peaks		Analysed by	Analysed by Oppur lang	for for	Jemes .	<b>.</b> l		
	<u>.</u>	estimated	ed peak area	area			Check	ed by					

JOD RADIAN (SALPEMENTO, CA)

THACER RESEARCH CORPORATION

Page 2

Date (2) 15/81

	•								7,4		CH	4	
- 1		3	777	1/5:		4	1/011			uq/1			µ9/1
standard	conc.	-		1,61	-		27.69			area	1		area
response from	rom	2		20 0	2		area	2		area	2		area
ul injection	1011	7		area	2		area	3		area	3		area
OFC for t	this cheet	\ \ \		d/area			q/area			g/area			g/area
-	,	J. arra	1/00	mean	area	µg/1	mean	area	μg/1	шеап	area		шеап
Sample 5/2/2	1	+	1,5	12200	197243	197243 20000	260000	8446833	860000	840000	225300	2670	746
4_					12/03491	270000		8916945	9,0000		2350cz	6772	
1_	1549 1410	2072605	2500	3600	2058098	2058098 275000	280000	280000 8805283 890000	\$90000	000006	000000	7670	127
1	(X.C.) 2500	-	<del></del>		2123168	J23168 280060		8952783 910000	910000		600507	4670	
St-17.1107'		23/1/69	<del></del>	0001	<del>-</del>	J1625112000	140000	14000 940300 450000	950000	560000	\$6000 625000	6757	177
→	_		}_		1-2	00005/1/225/		943903 960000	96,0000		C35000	0277	
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イナン	+	201867 CV	1		12204			1/201/9			1036531		
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-	RF						Analys	Analysed by Jehr	1/2	- Chra	, [		
Notations			interference wil	with adjacen	nt peaks								
	2		t eak	e	1		Chacked by	p.					

not analysed matemeak

JOD RADIAN (SACREMENT)

TRACER NESEARCH COAPORATION

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CONTENSED DATA

standard conc.				µg/1			μg/1			µg/1			µg/1
response from		-	;	area	1		area	1		area	_		area
ul injection		2		area	2		area	2		area	2		area
		3		area	3		area	3		area	3		area
RFs for this sl	sheet			g/area			g/area			g/area			g/area
sample time	amt in]	area	µg/1	mean	area	1/grl	теап	area	μg/1	теап	area	µg/1	mean
Stepth		CHCIZ	CHCl3	120 Cl		722	321	903	DIE	BEN ZENE	BENZENE VINYL	.97	0,
1-3		1.7	6.007	6,1	4.0009	$\alpha$	,06	C.W.	2.00C	<.03	7.1	009/	260000
VW-2		17	60.7	17	600.7	. 2	. 4	6.05	4.00%	4.8	17	340	J Souce
V60-1		2.06	10.7	1.6	tro . 2	`	6.03	800.7	2.003	6,4	4,7	c3200	25040
1/2-3-9		4.2	4.00.7	4.0	-		60.	600.5		4.2		6000	240000
V-3-7		4.06	7,007	2.06	.03	7,000/2	, 006	2.0008	,0007	4.34	2.0.2	2800	26000
S-18-430 5.5'		2.06	100.7	70.7	100'	, 0003	<i>700</i> .	2.0008			10,2	3700	24000
56-19-431 7		40.06	100.00	40.06	0.001	0.0004	0.01	800000>	0.008	40.04	₹0.0>	12000	200000
515-210-43P 7		10.07	100.001	10.06	9.00d	0.000	0.03	(0.000 B	(0.0003	40.04	(0.03	3100	200000
56-21-436 7		40.06	10.001	40.06	o. 003	8000.0	0.008	40.0008	(0.003	૪	40.03	3700	170000
56-22-43P 4		70.07	40.001	70.07	0.002	J.0002	50000	<0.0008	<0.0003	40,02	L0.07	1400	200,000
Sb-23-43L 4		20.02	20.001	70.00	400.00	CD.0001		<0.0008			10,02	1000	260000
5.24-12P 5		20.06		70.07	0.02	0,02 40.0001		20,000 8		0.4	10.07	5100	220000
56-25-12P 6'		77		6.2	40,000	40	44	60,03	27	(0)	140	23000	39000
, c 311-12-75		40.07	⟨0.00∫	40.0C	0.003	10:00:1	0.02	8000.07	0.00	10.07	40.07	100	24000
	PF	PSDODSP	e factor					<	1	1			

Notations;

interference with adjacent peaks not analysed estimated peak area response factor 

Analysed by the fang

Checked by

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300 RADIAN (SACREMENTO, CA)

THACER RESEARCH CORPORATION

DOD RADIAN (SACKEMENTO, CA)

TRACER RESEARCH CORPORATION

area area g/area µg/1 area กคลก ъg/1 area 2 ~ area area area g/area µg/1 mean  $\mu$ g/1 area area area µg/1 area q/area mean µg/1 area 7 24.3 4.07 area 4.07 4.07 **176**1 g/area 1.7 7 mean CHLORIDE Page\_\_\_\_ 25 700 4.07 4.07 ng/1 1.35X10-15 ノ 21859253 1 1857334 122 1000001 20 3 1818916 2000 15/2005 2000 15/2005 500 /10000 250 4100000 C100000 710000C 7 100000 927 300 /2/1000 2000 (15000 0000017 CO 0001 7 7/19/5 area Date 12/7/67 007 60/ 00/ 50 (00) amt in j A33 1,050 RFs for this sheet 940 858 953 845 standard conc. response from 130 ul injection といれ 804 831 731 8/8 an semol bythe The VC-3-9 VC-3-9 samble N2 Chank 164-3 16-3 Tm-7 VW-3 ノシー 4W-2 VW-1

Analysed by

interference with adjacent peaks

response factor

RF -

Notations:

estimated peak area

not analysed

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TRACER RESEARCH CORPORATION

DOD RACIAN (SAKREMENTO, CA,

290 > C 2931 X 200  $\mu g/1$ area g/area ひじごフ area area mean 23900 2900 2100000 | 22900 (KK) 19/J 2.53× 10" 997253 28800 CHU c100000 2235/32 290006 290000 8697555 970000 970000 4100000 982000 6 100000 area 2 14 330 63700 Jasogle 300000 30000 18795995 98000 19500 00 area area g/area 119/1 area mean 1200000/848/848 10000025 V10-10 411000 2 6435827 µg/1 6594073 5179189 739200 え C 100000 area area area q/area £ 13000 6 13000 µg/1 mean 10001 E 1970CEOC 1×10-10 51491  $\mu g/1$ 338158 597778 89600 73700 2100000 area 23700 area area area g/area ng/1 mean 3700 00257 0000017 23700 3,73 × 10-11 ng/1 70078 9 703394 26400 71858 7 Ŝ 10000017 7 100000 26544 000 arca B 0001 50001 1000 Soci 9<u>8</u> RFs for this sheet standard conc. 641 response from 1930ul injection SH t ime 14t-16 とると sample

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interference with adjacent peaks not analysed estimated peak area

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1, 1 11:0 त्र <u>119</u>/1 area area 7.05 V-5 1 <u>'3</u> area g/area SOU 2000 ,000 กะลก 2000 Two. C2500 K, W33 المفقه 4.006 6.008 4.00% 2.000 2.0366 3000 1,003 ,000. 1.00 2.006 **1.8**56 mg/1 2.21×10-17 32145716 2 :240 1360 1224786 70.74 425000 435000 J. 18887 30000 25000 1050W 63000 125000 1,000 05 225000 2,23 (23 5000 4250W 2204711 C25000 225300 75000 area 12.08 2.000 800,2 14.0005 6,56 x10 g/area 2.0008/c.0008 ₹10017/ area area area 4.0002 ng/1 2,0308 mean 6.00.2 4,000 \$ 2000. 4 LOSC2 4.0008 2.008 2.007 2,000 2.003 12500 LOOSE1 60.7 4.03 6. SS 22500 × 100 1000 CD . 7 |000507 ng/1 3 3074762 3009775 2 306 0186 A C25000 42500 525000 25,000 C 2500 2500 125020 C80577 000562 C2502 2615629 25000 22500 area L. 0009 area 4.0003 area 6000.7 £,009 g/area છે  $\mu g/1$ 380 30, 9 mean ,006 4.0009 4.003 1000 6000 4.0009 4.02 2005 , 00% 90. ઝ .05 µg/1 7.40×10-17 3 1353826 1 1332 177 21366113 5 150000 E 300051 75000€ 25006 14836.7 70000E 195729 tomoci 75000 725000 27873 525300 57017 रक्रमध्र 25500 125000 75000 area 0003 4.1005 1000.7 ,000, ,06 なって area area q/area 4 **1**/6d area 1,000,2 .001 Page 1b mean 6000 6000. 2,0005 6.0003 response factor L SSS. 2000 2 5000 2 0000 4,00  $\mu g/1$ 2000 / 125000 / 1000 9 100: 1,07×10-17 30 0418781 3 4 1859209 1883716 Costo 250 (22500) 1000 3000 06 2000/60000 42339 272693 225000 1818487 1703056 1200 | 205031 2000 138337 532055 57116 1611700 100 CL R area UUV) 35 305 28 1000 3 3 99 001 Date 13/7/87 amt n j 9 RFs for this sheet 804 1007 1007 1036 56-18-43p.55 1057 809 731 8 8 845 953 616 23 standard conc response from () ul injection 945 なべ 858 time SC-18-43p 5.5 accomple Duston Yan Viers N. I tank 6-5-37 sample 0VW-3 Yw-3 VC-3-7 15-3-9 Vw-3 6-W/ 12-3-7 クラン 7w-1 1-101 R

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Notations:

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			pg/1	area	area	area	g/area	mean	0.001		0.004		<u>6.00.8</u>		0.003			- KO. CO.C.		20.02		0011		0.00.					
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			µg/1	area	area	area	g/area	mean	100.05		100.07		10007		100:00			100.05		X0.001		2 10		10007			l Analy		Check
	7	CHClz						µg/1	(0.004	(0.001	4000	100.00	10.007	100.07	10.007	100.00	1	40.002	1000	(0.00)	100.07	8	, 77	700.07	, 100.0)	ì	140.001		
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Page 21		1. Cl.						1/61	40.2	(0.06	40.1	10.00	1.07	40.06	(0./	10.06	1	707	, 90.07	. 1.07	60.06	27	127	. 1.07	₹0.0°,	i	response factor		not analyses estimated peak area
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Date 12 /11/87			7007	e Caron		ec ( 10n	thice		7:17	78.77	40:61	12:21	13:39	12:52	12:44	13.58	61:61	17.12	5	_	15:56	08:31	16:43	12.8		£6:41	60:81	Notations:	
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			1/6/1	area	area	area	g/area	mean	3000		20.05		(0.000		20.00			20.000		C0.07		17		0.02						
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	907	2002						µg/1	(0.03	800.05	10.003	,8000 OX	(0.003	(बळ्ळ्ड)	(0.00)	40.000 B	t	(0.00)	80000	(000)	८०.००५	6.03	2.03	700.07	40.00g	1	— v	100		
ţ	7.87			1	2	3		area	125000	125000	(25000	000527	(25000	(35000	735000	22000	2627882	225522	(2500) (2008)	000527	020507	25500	dayse1	425000	(15000	236766	$\overline{}$	Anaiysed by	od by	i I
			1/6/	area	area	area	q/area	mean	10.0		6.03		8000		0.005			20.02		20.03		44		20.02			~- ************************************	Aliday	Checked by	
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Page	40.8	CC/4						uq/1	(0.0005	0.0004	1 7			-	0.0003	0.0002	ı	< 0.0003 + 60.00.0 >	1000.00	< 500.07	100007	3	, 5	(0.0003	100007	(	6.0006r	nce	analysed ted	1
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]			standard	morf esponser	ul injection		PFc for	1 —	1 167-10-15			4,20-43P7 12:21	5/5-21-436712:39	C14-21-431-713:52	44:21 4.924-C-12	6(1.17-428-4 (13:58	CTD	C14-22-43-4	56-23-43-415:30	5(1-74-128-5/15143	48.74.12P.5	Str.25-12P6 16:30	54.25.12RL" 16:43	00:11/2011-75-15	8-26-111/1/17:13	CTD	air samp			

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Page 2C

Standard conc.   1947   1947   1947   1947   1947   1947   1947   1947   1947   1947   1947   1947   1947   1947   1947   1948			DC. IDENIE										
1   area   1   area   1   area   1     2   area   2   area   2     3   area   3   area   3     3   area   3   area   3     3   area   3   area   3     4   area   19/1   mean   area   19/1   mean     500   (10000   (0.04   0.04   0.04   0.04   0.04   0.04   0.04     1000   (100000   (0.04   0.0	- t		1.12 11 11 11				1/011			1/bn			µg/1
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I interference with augaceme process NA not analysed E estimated beak area	18:05 Notations:	~	fact	r ioh adiacon			Analys	ed by	14	- Areal	11		
				area			Checke	d by			ļ		

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Page 2d

		Mar No	TALON TO	The state of the s									
		YINY	746514	1/011			1/60			1/6п			µg/1
standard conc		-		area	-		area	1		area	-		area
response trom		, ,		area	2		area	2		вгеа	2		area
מו זוו לפרניטו		, r		area	3		area	3		area	3		area
DEC for this	choot			a/area			g/area			g/area			g/area
Lime	amt	arca	µg/1	mean	area	µg/1	mean	area	µg/1	mean	area	µg/1	mean
+2	38	00000//	(0.3	, 1a07									
24-431 7111.48	2000	(10000	10.07										
56-20-43Ri12:09	9001		40,1	40.07									
4,-20-4397 12:22			40.07										
24-21-436712:38			40.1	10.07									
56-21-436412:51	2000	2000017	10.07										
S4-22-43A4 13:43	1000	2000017	40.1	50.02									
56-22-43-4~ 13:57	2000	7100000	₹0.07										
STD 14:27		100 1205559	t										
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56-23-431-4 15:30		0000017	, 40.02										
		1.02 000011	40.1	40.07									
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St. 25-12P.6' 16:45	20	5293203	140										
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air 118:05	12000 RF	suodsa I	Kigocod Ko. 07				Analy	Analysed by	1.4	merma	)		
Notations:		interfe	rence wil	interference with adjacent p	it peaks			1		(2)	ŀ		
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1600 2365 107 730 area 2555 g/area 1230 53300 42900 area t J J area mean 122900 803464 90000 190000 170527 23,000 778094 123000 ,960000 14,00000 122900 00817 00001 00091 00627 0000017 92000 1/100000 12 2900 60922 Joses 2900 23400 2900 538538116000 00627 0000017 ००६८२ व्यवकार 1, Ed/1 0062) 0000017 2900 6360 CH 1,69885 100000 / 100000 110000 4.4 0000017 186799 0000017 0000017 108851 area 2 2000/195 area area area ng/1 g/area 34000 200000 28000 mean 20000 8995/2 1200000 9092111 11250000 93000 0000 FP 25940FB G000CC व्यक्त भी क्या 0000 48 0000 46 0060168 0000 26 6255898 0000 49 0000 16 77681 18 0000881 F181858 00005H 1420000 99 0000 **ug/1** 3395275 380000 5470327 LI 0000 ج CKEMSE 2291525 3474190 8000000 1.57 573317C Analysed by area 23000 area area µg/1 area q/area 200000 ,2400D 2067786 27000 126000 20 0000 130000 mean 1508124 200000 23000 3,0000 22 0000 00005118748411 1900x 1386922 180000 260000 94 000 0000 81 0000 HT 64-0081 32000 2006 13 0000 78000 1605446 210000 1/61 S 822819 703873 700480 33997 346864 147083 788986 99 4831 61.C//#/ 166473 14437 interference with adjacent peaks ITSOIT 1698003 area 12000 43700 area area 23000  $\mu$ 9/1 area 1400 2/00 g/area 23) 11000 3100 mean 1382483 111 000 4 (10000 123700 168001 12000 43700 5300 uq/1 12000 0061 22000 61442.23000 284592 111 000 2900 1300 0001 3300 2300 43700 80= not analysed  $CO_{\gamma}$ 7.0 75855 0000017 27075 1688180001 603532 114605 10001 30184 131420 875269 141702 37577 0000017 h5h88 21.43 34396 area 000/ 0001 [80 [ 8 000/ 000 8 8 8 1000 8 8 8 8 8 1000 amt A A RFs for this sheet 56-25-11.6/16:33 56-26-11P2117:05 15:07 15:59 standard conc. 138 91:51 13.37 56-20-438-12:23 13:47 Jan 13:47 10: t1/c d11-98-93 Notations: response from 04:21-43C-12-9S 56-22-438-4/ 13:53 15:54 ul injection 56-20-43PF12:09 26-21-43C7/12:54 15:3 18:04 t ime 17:9119 OC-50-95 58-24-10P5 4-131-67-95 54-24-12PS 4-14-67-55 25-19-4317 sample STD 164-61-25

Checked by

estimated peak area

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Date 12/08/87

Page

μg/1	area	area	area	g/area	µg∕l mean	N2 CHY	92000 (3400	450,000 5.5000												
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	-	2	3		area	0	180000	160 000				-					_			<u>.</u>
µg/1	area	area	area	g/area	mean	202	00011	11 000												Analysed by David Ahranovic
					µg/1	Bengene	40.07	<.07												David AV
	1	2	3		area	9														sed by
µg/1	area	area	area	Q/area	mean	PCE	8000)	< 0.0008												Analy
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standard conc.	THE POUNTE FROM	ul injection	3555	9 4 4		C#502	10 1 10 m3 10 7	7 6 7			-				-			-	+	-
standa	ruspon	u de di	5	200	01 610	Compare Cime	VC-2-5	27.77	16 2 3			,								

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interference with adjacent peaks

Notations:

estimated poak not analysed

TRACER RESEARCH CORPORATION

Job Rodion Sacromento Cos

area C. 4 area area g/area µg/1 mean KO.0006 (25000 (10.000) 40.0006 µg/1 4.88 × 10-17 3 312 00000 1983556 2887970 0 000527 5.84 10174133 7877.85 TCA 16883069 15457312 35000 area area g/area area area µg/1 (0.2 ر ان ان mean 7.25×10-15 µg/1 10.09 40.09 40.09 40.7 6.07 70.7 235000 150.2 12-0CA 2199360 3275797 1352945 5.26 2007 (35app (25000) coast? 32000 25000 (25200 area 10.003 area g/area area area  $\mu$ g/1 1003 mean 500.00 10000 0.00 ₹00.00 3 (0.003 10001 71-01 × 60;  $\mu$ g/1 425000 10.00 3 1316699 2 70 3590 866 194 CHCB3 4.97 3500 000577 (25000 25000 020527 (25000 9 area area area area g/area µg/1 4.0 10.2 mean Page 10  $\mu g/1$ 425000 40.09 12000 K25000 K0.09 707 60.2 125000 10.09 K25000 (10.2 10.2 722 X 10-15 220 7220 1358323 3265129 2.64 CH2(122 32000 75860 735000 200 area Date 12/08/8₹ 8 3000 3000 000) 100 1000 amt in] sheet 0 8:37 standard conc. 84:6 response from 86:7 ul injection 9:34 6:27 RFs for this t ime 6.15 200 AIR Samo 12-3-3 sample 16-3-5 VC-3-3 MABIK IL MABIK I VC-3-5

interference with adjacent peaks response factor not analysed E A Notations:

estimated peak area

Analysed by David Abranavic

TRACER RESEARCH CORPORATION

300 Apolian Sacramento Co.

THACER RESEARCH CORPORATION

Date 12/08/83

Page /c

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Pocwari 300 mm/mm 200 mm 12/09/87 Page

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RF response factor Notations: I interference with a

ii I interference with adjacent peaks

NA not analysed

E estimated peak area

Analysed by David Abranavis

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TRACER RESEARCH CORPORATION

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interference with adjacent peaks not analysed estimated and the second s

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000.07 , 20 OC (000) 10.000 2000c µg/1 area g/area area area mean 40.009 10.0009 10.000g 10.0009 40.004 0.0009 10.0009 10.000 10,0009 10.000g 50.800 3.60 × 10-17  $\mu$ g/1 80.08 2132 6898 78 HI ZHI E 1/423044 25000 425000 COSCO CO 186,3359 25000 12500 cost? 22500 25000 35000 (3200 anse, 25000 PCE 32000 area (co.03) g/area 13/J area area (0.03 10007 20.00 46.00 mean (25000) (0.003 <0.03 \0.03 (25000) (0.003 625000 40.003 1.04 × 10-16 25000 (0.003 25000 (0.003 <25000 KO.003 µg/1 0,00 60.00 100.001 000527 (3500) 10.00 60.8 31951782 225000 K0.00 5/18/18/45 192989 608 425000 020527 32000 25000 2181894 area area area area **ug/1** q/area 100.00 /20.00 0.00 CO:03 0.08 mean 10.003 10.003 10.003 10.003 ×10-16 (0.00) 100.00 0.05 0.00 (2500 ko.00 547564 0.07 0.06 1/g/ 18:00 863905 80 14 38 857066 .0 2.08 25000 10.0004 412443 1637375 435000 2005(7 000557 531926 1000 (15000 (10.000 4 4.0.000) (2500D) 25000 22500 (25000 **152764** 6/ 1 701 9 area 40.000 40:000 Q/area **1/6**/ 10000 area mean 1000 (15000 (10.0004) (25000) (0.002 1000 (15000 10.000) 0.0002 1000 12500 10.0004 (0.00C 73500 (0.00) 7000.00 12500 10.0004 (25000) (0.0004) 1,000 125000 160.0004 40.00g 19/1 10/1 11255548 21041855 31131 632 1.75×10 6.07 725000 (250<del>00</del> (25000) 13500 224968 area 2000 Date 12/09/87 2000 07:50 2000 1000 18:37 1000 8 3000 280 2 **RFs** for this sheet 08:52 84(60 08:22 20:60 06:30 <u>8</u>:8 10:12 60:10 08:31 10:27 standard conc. response from ul injection Q6:17-10:52 t ime ai Sama \ر-4-> 4-7-4-4-71 14-2-3 sample N. BIK II h-h-71 1-2-21 1-4-7/ 12-2-3 1-8-21 215

response factor

interference with adjacent peaks not analysed E A Notations:

estimated peak area

Checked by

Analysed by David Abranovic

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THACEN NESEANCH CORPORATION

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interference with adjacent peaks not analysed

estimated peak area

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Notations:

Checked by

Analysed by David Abranovic

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TRACER RESEARCH CORPORATION

43600 4360C 73862 43600 < 39co ×3600 area g/area area area µg/1 mean <3600 73600 73600 (3600 (38C) 888 123600 0398 × 000017 40000 1360C <u>pg/1</u> 73600 03800 03987000011 00987 (2000/) 20987 73600 , 'o' x 3800 (10000) (3(00 2 786042 3828072 K 7806 28800 4 000001 00000/7 100000 CH7 000001 0000017 00000/ 0000017 10000 000017 apai 561108 3.61 000001) area 100 20006 72045801950000 94000 8900 g/area Baco area area area 000016 34000 mean 6786293 90 0000 0000 16 688889 5558002 8000 0000 68 9969/69 87 0000 7007-948 930000 5606586 1100000 K13000 6994505 93 1000 91000 000088 4801494 000221 930000 000088 OH HA 99 9000 96 OCCO (10000 | 13000) 7162419 PS 0000 rg/1 1.32 × 10-10 3557333 1.35 739200 84/5019 1,789545 8223448 Zy Zy WFFIL 560410 34611999 area g/area area 19/1 area 221000 25000 area 2400 0000 20000 210000 mean 180750 15000. 74208 100000 710000 20,000 1.40 × 10-10 24 0000 0000 97 8019581 20000 210000 78953 25000 000011 763238 125000 250000 21000 (10000 K14000 2000 7 2000 00 F/ >  $\mu$ g/13610643 1656985 2652993 .07 00 968 803324 1509980 1493167 420774 HFFF 15/8389 790979 475766 1453835 (160000 1874918 812499 0 area area  $\mu g/1$ g/area area area 3000 2000 288 0000 (100000 14300 +14300 00081 mean 9 Page 20000 00847/000017 24360 (100000)<4300 response factor 18000 ng/1 080 (100000 K4300 7900 2900 2300 9300 14300 88 9500 157607 68 00 110000 K4300 4.33×10-11 2603055 3625402 1600000 0.36 601 26400 171675 4211427 1000 (100000 163093 0000017 214599 196792 181428 45499 244912 601354 84619 area Date 12 /09/87 8 8 1000 000 8 1000 1000 180 89/ 8 8 8 8 ğ 8 8 8 amt In 1 R RFs for this sheet 8 02:21 47847 07:45 95:60 10:12 10:24 standard conc. 09:27 08:33 24:80 10:60 10:35 TS:11 56.27 481-7 112:09 ul injection 41:60 જ : ઝ 07.39 0.80 <u>=</u> 연 response from 89. time Ju Sumb. BIKT H, BIKIT AIR BIK C-4-71 sample C-4-21 SYST BIK h-h-77 h-h-1-4-1-8-71 1-4-7

Analysed by David Abranovic

Checked by

interference with adjacent peaks

Notations:

estimated peak area

not analysed

THACER RESEARCH CORPORATION

Date 12/09/87

		CH2 000	0		CHCB3	~		12.0CA	)CA		7CA		
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RFs for this	sheet	6.43×10-15	10-15	Q/area	1.36 ×	×10-16	g/area	6.52	6.52×10-15	g/area	5.63×	(10,13	g/area
و	1	area	ug/1	mean	area	µg/1	mean	area	μg/1	mean	area		mean
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interference with adjacent peaks

not analysed estimated peak area

300 Apolion Sacromento Ca

THACER RESEARCH CORPORATION

Date 12/09/87

Page 2h

			1000			TCE			EOB	8		PCE		
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113611	0/	, r			area	2		area	3		area	3		area
Offe for this	is shoot	+	1.75×10-17	F1-0	n/area	1.19×10-16	2-16	g/area	1.04×10-1	71-01	g/area	3.60×	11-01	g/area
			area	1/01	mean	area	µg/1	mean	area	µg/1	mean	area	µg/1	mean
Tib	+	1	B		, (0,002)	250900	'	60.0	425000	(0.003	100.07	020227	40.009	(6.000)
_	1	1		-		HO 0 988659	`		35000	(0.001		725000	40:004	
Ch-261-8, 13:40	1 -	200	0000	1	10.0004	354244 0.04	D.04 -	0.04	22222	10.003	(0.003	000587	(0.000%	10,0009
C1-79-81-8 13.		1000 120	HO00.01 000721	6.0004		362750	0.04		03050	(0.003		425000 40,0009	(0.0009	
4.30-191.8 14:12		ī	125000 1	10.0004	10.0004 h0.0002	1354527-10.2	6.9	6.9	(25000	(0.003	100:07	80000	800000 0.03 1h	0.03
4,20,-(91-8, 14:31		Jaco Kasan	ı	100000			0.2		125000 40.00	100.07		1859364 0.03	0.03	
(1.306-691.8) 14:48 1000 K25000 K0.0004 - (0.000)	201 8h:	λ 2 2	2005	0.0004	,(0:co)	75587511		1.05	000367	40.003 -	10001	E0SE 169	0.03	20.03
G-306-811-8	2000	8	135000 k	(o.cco)		2268123	0.1.0		435000	, 10001		1217198	0	
ST (77)	01 08.5	1		ı		837752	1		2412691	,		1370555		
18.7	000/ 05		2000	125000 60.0004	<00005	249907	0.03	50.00	(25000 40.003	(0.003	100.00	000001)	60000	10.000
CO: 3/ 8-187 18-15	ŀ		200257				6.03		135000 40.001	100.07		V/00000	, 500.00	
61:31.8/18/16-17	]	$\overline{}$	Saco	(25ap (0.004.	(0000)	18662	0.03	20.00	200057	500 co 5	10007	1	(0.000)	<0.00×
453491-8/16:32		70 my	Smo	vason (0.002)		425577 0.03	0.03		25500	(0.00)		00000//	10.009	
STD (K)	$\mathbf{I}$	, 8	081616	1		P40404	ì		1339780	1		hessea	,	
9	] _	โก		20.000		Som	6.004			(0.00)		23200	haso.o>	
	}	_	Г											
	-													
2		RF re	response	factor		odeog 4		Analys	ed by	avid A	Analysed by David Abrahavic	. 01		

Analysed by David Abranavic

Checked by

interference with adjacent peaks not analysed estimated peak area

Notations:



## Date 12/09/87

Page 2 C

		0 .77	0.000		R 0400	0 - 6							
July brobacto		X 0 0	7077	1/01	2007		ug/1			l/gr			µg/1
Standard conc.		78 -		area	7 -		area	1		area			area
response trom	•	,		arpa	2		area	2		area	2		area
חז זוו ופרנזמוו	•	3		area	3		area	3		area	3		area
DEC for this shoot	) oc	9.52 × 10-16	91.01	0/area	86	91-01X	g/area			g/area			g/area
time	amt	arca	ug/1	mean	area	µg/1	mean	area	µg/1	mean	area	µg/1	mean
5,12:15		Q	(0.1	W	۵	\$0.08	40.07						
12:40			(0.05		1	10.00							
-	88	Ø	6.0	6.0	रक्रद्रद्रहर	γ,	4						
	}	92.7211	6.0		Scrocco	4							
(1-20-191-911-12	8			20.05	80.00 coo 0017	80.08	10.09						
_	200		5		മ്മമി?	i							
8/1:11/5/18-102-1)	8		107	3005	(10000		40.04						
+	2000	2000 /100000	40.05	ı	0000017	40.04							
	9	1655492	1		Foreco	1							
49.815:50	8	1000 K 100 000 (0.1	1.07		0000017	80.08	10.04						
	88	(100000 (0.05	50.07		(100000	40.04							
61:91 8-16-15	8	7/0000 /0	. 1.07	SOON	C1(DBCC)	٦٠,	40.07						
I .	282	(100ac)	, 3007		0000017	, 60.07							
1	9	2513247	-		6000000	Į							
81:18	282	000000/	60.05		7/100000	10.07							
		1					!						
Notations:	RF -	respons	response factor	h ad lacen	t peaks		Analys	Analysed by David Abranovic	VID AL	LANDE	. 4		
	•	1111111		,									

interference with adjacent peaks not analysed RF INA E Notations:

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Date 12/09/87

Page 2d

			602			0			4			CHY		
standard conc	conc.		26400	2	µg/1	816.00		1/6п	239200	Q	µg/1	28800		µg/1
response from	from		1		area	1		area	-		агеа	-1		area
ul injection	ction		2		area	2		area	2		агев	2		area
1			3		area	\$		area	3		атеа	3		area
RFs for	this sl	sheet	4.33×10-11	11.0,	g/area	1.40 ×	01-01	g/area	1.32)	01-01 X	g/area	3.61×10-11	,,_0,	g/area
	Lime	amt	arca	ug/1	mean	area	µg/1	mean	area	µg/1	mean	area	µg/1	mean
11	12:33	8	122841	5300	4900	1233569	170000-	18000	2434158	7434158 980000	38000	0000017	<3600 -	1360C
56-28-19PS 12:36 1000	2:36	1	105015	, 0054		1388403			1324618 970000	97ccc ,		00001>	(3600)	
10:41/8-189-82-95	10:4	1 .	1000 481890	21000 - 21300	i l		76,000	74000	23/33 98 0000	480000	340000	(1000)	<3800 ·	73800
40:M 8-78-8.	}	000)	895484	2/000			7/0001		CHOKED 4600C	16000		(COCCO)	13600	
04.418114.00	1 ~		239242	10000	10000	1314482	1,80001	20008/5	155071	155017/81000D-		560000 K100000	43600	X36CX
4.37.69 8 14:44 1000 2551RP.	<i>bb.b.</i>	1000	255/80	11000		1307338 180000	180000		6438P2	850000		(10000)	73600	
9,30681-8/14:57	4:57	8	0EEES/ 000/	00 79	7200	1476197	476197 210000 - 2000x		(५८५३)	6487679 860000		26.2000 KICEODO	13600	23600
SG-301481-8/15:13 1000	15:13	Ì	580681	20056		1410842 20000	20000		6578681	570000		710000	<3600,	
STD	hh:51	8	5196,19 0001	-		177054	1		628752	1		821238	1	
00	15:59	$\alpha \infty 1$	3,7903	16000	17000	255518	* CO0011	- 16.000 729762	- 1	970000	380000	970060 - 980000 K100000 K3600	<3800 ·	(3600)
h1:9[8-769-18-95	h1:9	000/	04C80H 0001	18000		641717	90000		740621S	580000		7/00000	13CO	
4,-326918 16:29	6:30	<u>1</u> 88	1800 77967	3400	3300	1698435	140000 24000	24000	1921189	-00011 1051B89	920000 4100000		< 3600	7078 7
14:91 8-169-62-15	14:91	_	1000 73445	3200		1643905	230000		6973115	92000		7/0000	73987	
STD	7.76	_	1.28 1000 62522	1		818582	1		6014818	l		Sh8888	1	
AIA	17:31	8	33088			1793604			345199			(100000)	<3600	
		RF	respons	response factor				•			٠.			

RF response factor Notations: I interference with adjacent peaks

not analysed estimated peak area

Analysed by David Abranovic

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			µg/1	area	area	area	g/area	mean					20.07		0.03		20:03		50.00		70.04			wac.					
7				63	234	90_	× 10-17	µg/1	100.00	100.00	100.00	8000.0	0.03	10.0	0.03	0.03	6.09	0.09	0.008	100	0.06	0.02	1	10000g	, 600.00				
		TCA	7	15/936	2574034	3665506	8.53	area	<25000	(2,5000	43800	20000	385278	224365	798818	37476	8E56E1	285188	91472	135446	660731	25390	934625	0000/	2000)	٦	1		
			ug/1	area	area	area	g/area	теап					10.06		90.07		90.05		1.07		40.05			107		Abranovic			
	9	DCA		000	95	402	10-14	μg/1	20.3	2.03	40.2	40.06	10.06	10.00	1.07	10.06	1.07	10.00	1.07	1007	1.07	90:00	1	40.7	, //>		1		
	5.29	12.	38	1,150000	2121296	3202902	1.27×10-14	area	(25000	000527	(25000)	(10000)	(10000)	000017	11000	20001>	(1000	00001	110000	110000	<i>(100</i> 00	(1000	287800	KIDOCC	20001	Analysed by David	<b>3</b> 2	À P	
			µg/1	area	area	area	q/area	mean					(0.00)		10001		100:07		20.02		100:07			(0:003		Analys		Checked by	
	6	23		56	60.	7-7	10-16	µg/1	(0.003	20.003	10.003	100.0	10.001	100.00	100.002 4.00.001	0.001	10.00	, Joo.0)	10.007	(0.00)	(0.00)	100.00	ſ	(000)	10.07				rhy
	4.99	CHC	0/	1546656		5060	2.13 X		0			I	CO0001)	000017	(10000			10000	11000	(10000)	(1000	410000	734844	(1000	000011		t peaks	8	y lowerthy
6			ug/1	area	area	area	g/area	mean					10.05		90.07	•	9007		,4a/		4,006			, 50.1			interference with adjacent	_	lowerd by
Page		4		2.7	3.6	C	41.01	ug/1	70.07	40.2	40.2	40.06	10.06	10.06	7.07	60.00	(0.1	10.06	(0.1	(0.1)		. 90	ī	(6.1	, 17	response factor	rference wit	-	
	7.68	CHZCH	900	1 164 05	2 149086	3 16 5 370	1.25×	1	(25000)	230004 0.2	(15000	_	_	_	$T^{-}$	1 -		710000					24327	(10000	1100cc	respons	interfe	estim	' ' .
18/01		·				0	sheet	amt	3000	300	2000	88	200	2002	(00)	8	8	agg	1880	88	8	288	01	/8c	100	7.	_ X	ω, ω	Jetechon
Date /2 //0/87			conc.	from	ction	-	this s		06:13	26:36	74:39	03:38	80.80	80.80	× 80	87:80	3:68	20:13	36.36	8h:60	10:03	10:16	10:29	54:01			Notations:		
٢			standard conc	response from	ul injection	;	RFs for	sample	1	١.	<u>:</u> آ	Cuer Alk	1,40		75.80 F-112-112-75	Ch-24-771-7 08:48	54.35-121-8 D3:0C	9-30-31-8	2.	51-32-201-7	S4.39-22R5 10:03	5-10-28-12	STD	8.77.8.15	8-777-85-95		Nota		2

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TRACEN NESEANCH CONFORM THON

			1/6/1	area	area	area	g/area	шеап				İ	10.000		0.04	•	6.3		0.03		2.04			0.00		
				2			4	_	(0.007	0.0003	(0.007	9000.0	7600037	0.0003	1	0.03	7	0.7	7	0.02	700	0.03	(	0.03	9000	
	10.1	Pel	7	184145	2 932298	3931457	5.54 x	area	7 000527	425000 (0.0007	732000	20000	100001	110 000 KO.0003	0 90/589	1686671	3621726	7622990		350719	$\neg \top$	1815701	201273	394.46	410000 40.00b	
			L/g/	area	area	агеа	g/area	mean	7	7	V		800007				80000		10.00 J	0	211224 800000			5000×	7	
				719	7456	00 6	9/-01×	µg/1	500.05	(0.007	(0.00)	410000 Ko.0008	410000 KO.0008-		410000 KO.002 \$10.008	(0.0008	10.003	8000.01	-17	(0.003	(0.003	<0 00 D8	1	(0.003	20.07	
	2.78	EDB	20	1 1037719	21245456	31313998	1.67)	area	00SC1	(25000 (10.002)	(25000)	(10000	410000	(10 000	000017	(10000	(10000	000017	020017	710000	00001	apoil	0312561	(locac	(1000	
			ug/1	area	area	area	0/area	mean					0.03		0.3		90.0		0.03		d			C		
				7 &	74	263	10-16	1/64	(0.00)	10.02	0.008.	10.0		·	6.2	5.1.0	0.07 T	0.06	0.02	0.03	78	م	1	ત		
	0.00	TLE	0/	1 493084	774417 6	1	ł .	area	0	2000	_	136769	1 1	297567	7127		1 48841			184361	133,6920	20493929	967430	9.85490	631692	
14			L/gd	area	80.10	0010	0/9769	mean					/owo/	$\Gamma^{-1}$	10000)			1	,{aoos}	-	100001			(0,0003		
Page				67	00	2 7	41-01	1/00	(0 mo)	70.003	10.003	0.0003	10000	$\Gamma$	, 0.0003	(0.0001)	70 003	100000	$\Gamma'$		(0.0003	100000	1	(0.003	(0.003	,
4	,	(624	7	07(75/1	ט שט שר נ	70000	71-01 x 0) c	arca	B	Τ-	13 CO.CO.2	20000	(1000)	7				0000//	1		_	Γ	T			
(10/0/	2	<b>'</b>					40040	amt,		7	T -	Ŧ	•	7	T	T	1	1	000/	82/	000	2000	0/	337	00)	
Tate 17 (10/07	2000		f conc.	i from		EC C 1 Ou		1 mg	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	7 7 7	85.70	1	1	1	38:30	80.80	6.9	20:13	35.85	84:80	10.03	10:16	65:01	54:01	511	
_	•		standard conc		icaponae i i	ul injection		Sommes and a		1	1	Y HOH		C4-22-49P.3 (28:32	SE 80 +-16-115	8h.8u 2-16-h-7	4-15-11-8, 19:00	Ch. 25-771-9' 179:13	光めたルーでろ	86-36-716-3, 108-48	4,39.22PG 10:03	4.37-22P-5/10:16	QD D	24.38.22k.8'	%-107-&-9S	

interference with adjacent peaks response factor

RF
Notations: I
NA
E
AOTE: Defection &

were lowered by lowering not analysed estimated peak area

THACEN MESEANCH COMPONATION

		1/дч	area	area	area			µg/l mean																		
			1	7				area																		ŀ
		μg/1	area	area	0010	di ca	g/area	mean																		Analysed by David Abranauic
								µg/1																		A biva
			1	2	7			area																		ied by 🗅
		uq/1	area	0010	ם עם	агеа	g/area	mean					60.00		(0.0)		50.05		(0.03		20.07					Analys
			4710	1	996	283	7/-0/	µg/1	60.0	C0.07	0.02	20.07	7	0.00			1		_ 7	0.03	10.03	(0.07	1			
7	7.68	Dengene	471 07671	0/0//	6,000,100,1	315000	3.07 × 10-16	area	(100000)	(100000)	(1000) (0.07	(1000 (0.02)	20.02000013	(10000 KO.03	110000 (0.03	(10000 (0.02	(100000)	(100000 10.07	00000)	4100000 KO. 03	((0000		£/5000000	H	I	t peaks
16		1/011	+	1	area	area	g/area	mean	_>	,	×	~	(0.03	-4	(0.03	-	40.03		40.07		8003			07		response factor interference with adjacent
Page		Venyk Chkeriche	0000	107	3971	338 2329	71-01	µg/1	0.03	0.03	60.03	60.03		1	Γ,		7	/	10.07	(0.03	~	(0.03	ţ	- 0/	11	response factor interference wit
1	7.78	yeary o	70,00,300	1377	2 383 3971	3 338	6.84 × 10-16	area	000001	2000 K100000 K0.03	110000000	1000 (100000) 0.03	Juno (1000) (0.03	K100000 40.03	(100000)		(10000	_	(100000 (0.07	000000)	00001)	(10000)	307.37.BL	14493134	8608951	respons
18/01	<u>_</u>				J/6101 . 34	Viny10 100	heet	amt 1nj		2000	2000	2000	مسر	88	1		1	1	1		000/	3000	8	1000	00/	RF -
Date 12/10/87		- 1	COME	moli :	ection Beny	Viny	this sheet	Lime	06:13	25:30	38	4	1	08:23	42.80	67.00		H:60	09:37	94:49	70:0/	F1:01	10:30	0:46	h1:11	Notations:
J			Standard	response from	ul injection		RFs for	sample			ATP 500 06:38	STOT OIL	~` اـ	45.869P3		C5-12-12-15-75	10:60/8-177:52-17	H: 80 8.17.58-95	56-32-221-7 109:37	56-36-311-7 09:49	(6-37-22P5 10:02	54.21.01 5 911.75 .22	STD	Jr.38.221-8 10:46	<6-38-221-8	Nota

interference with adjacent peaks not analysed estimated arm

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<del></del>			µg/1	area	area	area	g/area	mean					3700		133CX		733CC		73300	-	1320C			23300		
		7		38	175	392	11-013	µg/1	43300	<3300	<3300	(3300	(3200.	(3300)	₹32œ -	(3200)	(3700	43200	<32.00 ·	(3700)	13200-	, 3300 ,		X3200	43260	
	2.41	CHY	28800	1921538	2904975	3903392	3.16 × 10	area	(10000)	(10000	(10000	0000017	020017	710000	Klaaao	(10000)	0000017	0000017	7100000		760000 K10000	$\alpha \alpha \alpha \alpha / \gamma$	haahs8	7/2000/	200001	
			µg/1	area	area	area	g/area	mean					28/000		1		30000		2005		260000			160CO		
			00	285	547	6861	1.25×10-10	µg/1	<13000 	713000	000098	8500C			74469 89000 - 89000	89000	7213760 90000 , 90000	900000	7634001 950000	45000	750000	260000	,	99,000	X3X37 940000	•
	1.34	$N_2$	739200	1 595 9085	25915547	35907989	1.251	area	000017	000217 000017	00098 855889	20058 8389149	69934G870000	000088 1699000	146969	000 63 065 7412	7213760	71760 90000	1001591	7582450 95000	2993480 750000	11 45503	58877202	रास्ट्रस्य	23237	
			ug/1	area	area	area	g/area	mean					21000		92000		20096		28300		150000			28000		
				38	75	00	01-01	µg/1	∞  -  -	00011	230CC	220000		$\sim$	7	1000001	93000	1000001	87000.	, 000/6	190000	190000	ı	44000	,00072	
	7.06	Ö	84600	1847038	2848175	3844900	1.06 × 10-10	area	Q	00011X000017	2138111		1962303210000	6110261	791754 gy000	0000011 240886	875989		7	803898	00006/ 2568841	1831777	923874	41163	045790	
79			ng/1	area	area	area	d/area	mean					006/		0006/		0009/		3200		920			3000		
Page				167	481	163	11-01	UQ/1	13900	73400	739.00	(39.00	2000	0081	21000	17000	17000	15000	3100	1 0025	. 00//	, 078	I	3200	7800	
	78 0	50	26400	167023	£86847¢	3670763	392 X 10-11	arca	MPE / CIDEO(17	OU bt 1000017	00 627 0000017 0001	1100ars (3900	52179	$\Gamma$	534743	158484	437587	394971	79423	80434	09690	21285	H90559	80759	1890/	
20/01/	2					0001	sheet	amt		8	1000	3	8	8	1000	8	8	8	88	88	8	8	88	3	1000	1
Nate 10 1/0/82	10 m		CONC.	from		0/	this st	1	(7.7)	777. 10	75.39	85.40	08.30	7 m	74.80	15:80	01:60	08.33	85:10	10:01	10:13	10:25	10:38	10:55	11:22	
	j		standard conc	morf eagonsur	ul injection		PFe for	o la mass	CC. 27	HAID THAID H	ATO 5.00 1739	CVCT BIK 07:48	04-22-(98-2) 08-20	4-23-1963 08:31	t-1(1-16-51)	1.	01:60, 8-10-56-95	4.35.21-8, 09.23	56.36.21.14.95 Oct 558	10:01/4-121-8-98	SG-37-22P-5/10:13	4.37.20P5 10:25	(T)	8-38-38-31-8	G-38-211-8	

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interference with adjacent peaks

response factor

not analysed estimated peak area

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Notations:

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Date 12/10/87

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			CH1 Ch2	2.2		CHCB3	6		12.1	2.0CA		TCA		
standard	conc.		200		µg/1	0/		1/gr	200		µg/1	5		µg/1
response from	from		1		area			area	1		area	1		area
ul injection			2		area	2		area	2		area	2		area
		0	3		area	2		area	3		area	3		area
RFs for	this st	sheet	1.25×10-14	4,01	g/area	213 × 1	1,0,1	g/area	41-01× £ 2.1	h/-01	g/area	5.83 x10-17	5-17	g/area
sample	t ime	amt 1n]	area	µg/1	mean		µg/1	mean	area	µg/1	mean	area	µg/1	теап
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Page 2b

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THACER RESEARCH CORPORATION

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56.45.8T-7 59:33	8.82	æ	(10000	(2	20.05	(1000	<0.7	10.006						
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estimated many not analysed

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5340C 134CC (3400 3400 26 3400 2350 area area area  $\mu g/1$ g/area mean 00000 1 3400 (3400. 00487 < 3400 7 3400 13400 3400 13400 13400 <3400 43400 (3400 /00000 13900 13400 **1**2/3 3841550 3.39 x 10-11 2865409 04448 00887 (lass) 00000 ⟨@@ (@@@ appoli (BD CB)  $\infty \infty$ (10000) 0000017 18000 2.37 0000001 (10000) 915318 area 2000 area area g/area 19 area 22000 -98cm Syano 8000 88000 mean S con-7478870 100000 89000 C528487870000 90000 8000 54354788000 000018 9891, 969 (10000/13000) 7-Mass 7-1960000 <u>කත</u> දිද් 960000 (1300 6332981 R5000 35542482 **J**g/1 15496767 1.34 × 10-10 25522229 739200 32 6103355 H8SSTR 5451129 3728943 5947373 signal in 634331 1980511 3 area 2205594 22000 - 220000 13000 q/area 23000 - 23000 **J**0/1 area area 24000 26000 2(000 Lond mean 13000 24 000 2308434 230000 27000 00867 1089310 21 ecco 130000 2457495 240000 26 theo 2176511 1210000 9.75×10-" 0086> 2142045 210000 µg/1 ध 2905393 1912043 3937957 1.04 2333286 336348 00968 (10000) Sample 191970 0000017 2359965 550209 289639 1010498 area do 4007 агеа area 800 **M** area g/area 3200 23-t2 00245 280 2007 mean Page 1d 27000 21000 8000 4400 19/1 00HH YOOOOO 1 K100000144000 21000 3300 00447 (2000) 1300 00 000 (4400) 3100 1300 00,5% 4.43 × 10-11 1589236 2607587 3595481 0.36 26400 30445 SSHEON 0000) (10000 476093 75036 655019 30187 घटाटव 707 71871 **19253** arca Date 13/11/87 8 1880 8 8 8 80 <u>8</u> 80/ 8 8 8 1000 8 8 8 1000 200/ E C RFs for this sheet 10:13 AIR Same 106:51 Syst RIK. b7:35 standard conc. 08:28 94:60 25:30 H2 BIK II 106:47 80:80 H38:08 28.24 response from 80:38 ul injection 79:24 10:31 11:80 8.4 t ine 8-18-91-95 1-70+ ch-95 Jr-43-86-4 5245-81-7 8-18-HA95 8-18-91-8 Sb-45-81-7 8-18-14-95 sample W-2-7 16-2-7

Notations:

Analysed by David Abranovic

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( <u>(</u>	1187					ب و		Sheet		7007	$\top$				+	0	7						П	T		$\sim$	46	. <b></b>	۷ Z
	0ate <u>12/11/8</u> ≠		Touc.		e tro				Lime	45:11 55:01	12:28	17:41	17:27	13.10	01:10	14:57	111.51			17:17	16.28	14:43	16.56	0.4	17.25		17:53	Notations:	
•	_		standard		response from	ul injection		KIS IOI	sample	h-70x8h-95	24-10-121-2	14: 21 2-14-64-75	75:21 7-14-67	170000	01:01	Sect Rik	C10.52-201-2	C4-52-281-3	(L. C. 20 )	2 2 2 201-1	26.55-201-4" 16.28	54.56-2814 (A.S12)	1-18-95-15	n-102-75-75	C. 4.5-12	05. 51 1-180-55-17	O-LV	_	

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86:91/1/85-55-515	82:3/	300	h66£99		10.05	1231स	9.0	2C.7	000017	10.000	70.02	284.56.56	8.0	3.00
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Date 12/11/83	183	ا بردر <i>ب</i>	Page 2C	7.34								
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Standard Conf.		- V 0	1/0/1	500		µg/1			µg/1			µg/1
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le time	amt in)	area µg/1	mean	area	µg/1	mean	area	ng/1	mean	area	µg/1	mean
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Notations:	<b>—</b> ;	interference with adjacent peaks	with adjacer	it peaks		o ( Tellus )				i		
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Page 2d Date 12/11/83

<3400 1340c F (3400 <340C 7340(3400 73700 <340C area  $\mu$ g/1 area area g/area mean < 34∞ <3400 3400 4348 13400 13400 (3400) (3400 3400 3400 <3<del>4</del>00 23.£8 23/62 2400 (3400) 1/67 <3400 28800 g/area 3.39 x 10 2.37 0000/ 960000 (10000) 0000017 (/0000 880000 (100000) 240000K100000 00000/2 895263 0000017 00001/s000/6\ (10000) 00000// 20000 000001) 00000// 0000017 100,000 area 800009 94000 18/1 area area area 98ccc0 /00000/u mean 1348493 |980000 -260000 7000000 940000. 6598084 48000. 1000000 1932530 930000-7095169 950000 99000 22000 HPKSIF BOOCL 6947613 | 93000 860000 1005348 140000 000000 5931704 1930000 28 300 930000 V10-10 µg/1 739200 1. 32 4528574 , юзчая 7387433 596920 5402663 562569 1504000 50 1.34 area 220000 19/1 area q/area area area 25000 1/0000 22000 150000 19000 mean 250000 2212770 122000 225/107 220000 00096 230000 220000 260000 ग्रहिस्यम् गुत्रक्टळ 190000 220000 120000 27629431270000 25000 21000 9 0000 9.75×10-11 µg/1 1.02 89600 2537478 248659 2546948 icate n 24894 WH2 19803K 133381व 1987534 369956 247306 0 22198 86888 1371175 area 2 ممل مر 7600 7700 0000/ **µg/1** area area area g/area 201175 0019 13000 - 12000 000/1 mean 110000 K 4400-1 ~ 00hh? Somole 00001 6700 7900 µg/1 8600 00445 7500 I Boo 74400 <u>で</u> 5000 00/3 4.42×10-11 26400 400 1000 K10000 2000)> 1000 295091 (10000) 17 0000 233528 0.36 1000 6307A. 138986 17808 1000 275431 0 24 1915 249833 193579 714074 52413 area 000/ 8 8 8 80/ 8 80/ 8 8 98 160 B 8 000 B RFs for this sheet 15:25 12:37 17:37 standard conc. 14:18 56-50-421-6/13:05 ul injection 50:41/h76-8h-75 95:51 80:41 response from 16:23 50:t||h-88:95-85 15:50-12:31 0h: 7 t ime 91:21/4-17-86-95 809 16:41[2-28:4595 16.91 54-53-38-3 56.53-381.3 79-78-15. 85-38-2 75-38-4 56-49-426-3 512-14-13-3 7-11E-1/5-75 h-18E-55-95 178.95.95 sample SID

response factor RF Notations:

8

interference with adjacent peaks not analysed

estimated peak area

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Analysed by David Abranguice

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			-		ятея			area	1		area			area
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ut injection			7 4		a d L d	-		area	3		area	3		area
DEC for t	thie ch	shoat			0/area			Q/area			g/area			g/area
		amt	area	1/0/1	mean	area	1/gri	mean	area	µg/1	mean	area	µg/1	mean
<del>                                     </del>	202	(110)	14.00 CH/03 12-DCA	12	6004	TCE	EDB	PCE	Vinyl Mail Bengana	Bengana	9	02	Na	<u>CH4</u>
4.58-74P.1 (0.06	200	00000	40.07	_	100001	80.0	9∞∞0>	0.0/	<0.05	(0.03	44700	240000	80000	399
4-59-74P-3 10.06	1	60000)	# w w )	P00.0	0.00/	0.08	40.000		(0.05	20.03	00th7	240000	220000	(3900
24-40-741-8 XC		40.09 (0.04	10.04	0.05	/0000/	2.0	(0.000)		40.05	50.03	1200	230000	80 0000	<3600
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Notations:	ons:	RF	respons	response factor	response factor interference with adjacent	ot peaks		Analys	sed by D	Analysed by Bould Abronouse	MOUVE	ļ		

RF response factor
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	*		2.6	•		4.9			5.2	~		5.78		
			CHACRA	as		CHCB3	3		12-	2 - DCA		TCA		
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ul injection			7454 812	374	area	2,50,00,00	8	area	2251767	79	вгеа	2658893	893	area
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diesama. 107:27 2000	7:27	2000		10.06		(1000)	10.000		(10000	10.04		89264	2.003	
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54-58-24P.2 09:15	i	3000	000017	10.06	40.0%	000 017		10,000	(1000	10.09	30.0%	209038	0.008	0.008
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		700		(0.6	,40.06			(0.0009	\$001	10.4	10.07	$\overline{}$	40.004	20.00
56-59-24P3 09:57		3000	20017	1006		(IDAC)			(100 aa	10.07		81046	0.004	
01:01 8-142-03-10	- 1	gg	7/0000	40.6	30.05	200017		10.009	110000	40.4	10.04	1187763	- 50.00	20.0
56-60-241-8 110:23	i	2000	(10000	10.06		7,0000	10.009		(10000	10.04		KIOCEC	(0.004 WA	
56-61-311-8, 10:39		200	(10000	40.6	10.06	(10000)	40.00	(0.009	(1000	40.4	70.07	(1000	40.00	0.00
CS-01_8-11-95		>	(10000)	(40.05		4100co	(o.000)		(1000)	10.04		$f/\omega \infty$	0.000	
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56-63-24-5 13:12		2002	000017	10.06		- 1	10.009		(1000)	60.00		2355700	100	
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response factor

Notations:

interference with adjacent peaks not analysed estimated peak area

Analysed by David Abranovic

TRACER RESEARCH CORPORATION

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			Cau			TCE			EDB			PCE		
standard	d conc.		0		ng/1	01		µg/1	20		1/6/1	5		µg/1
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Not	Notations:	<b>⊢</b> 2	interfe	interference with adjacent	h adjacen	t peaks			<b>3</b> <b>7</b> <b>3</b>	141211 147	7	Į		

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Page 1C Date 12/14/87

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			Vinel	Vinul alloide	þ	Bensone	ne							
standard conc	d conc.		25		µg/1	500		µg/1			Mg/1			µg/1
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interference with adjacent peaks response factor R - R - B Notations:

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Analysed by David Abranovic

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	Date 12/14/87	8/11/	Ÿ	Page	6									
	-		2.6			4.9	9		5.2	7		5.78		
			CHARRA	28		CHCB3	23		12.0CA	64		TCA		
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7-9-M	14:52		700017	10.6		000 01	40.009		(10000)	40.4		14290372	6	
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Not	Notations:	RF -	respons	response factor interference wit	response factor interference with adjacent	t peaks		Analys	ed by Do	Analysed by David Abranovic	anovic	1		

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alumes	1 jme	amt	area	uq/1	mean	[	µg/1	mean	area	μg/1	mean	area	µg/1	mean
× 1.3	13:42	7007	200012	10.001			0.02	20.02	OSD01>	(0.006	7 0.0006	000017	6000	00.00
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11-6-7	60.71	200	70000	100.07	10.07		0.9	0.3	$\alpha \alpha \alpha \beta	(0.006.	\$ 40.00 \$ \$10.00	$\top$	40.003.	(000)
11-12-17	14:22	200	000017	100.001			0.2		(10 000)	10.006		- 1	₹00.003	
C-2-7	(4:38	200	100.0 > 000017	10.00	1000/	228852	0.2	, 0.2	000017	10.006-110.006	$\neg$	40000	(0.003	10003
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Date 12/14/87 Page 2C

19/1 area area area g/area mean  $\mu$ g/1area area area area g/area µg/1 mean rg/1 area area 1/61 area q/area 40.03 mean 40.03 69.3 12/21 3,0/x 54.5 Bengana 7.2 \(\partial \partial \ 00001> 500 area **µg/1** area area g/area **60.0**5 mean Vinyl Chlorido 1767 6.05 9.0 9.19×10-16 \$ 100000 2000 1/10000 area 200 98 101 RFs for this sheet ul injection 13:26 standard conc. 13:42 response from t ime sample 8-1-7 8-1-31

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Page 24

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interference with adjacent peaks not analysed estimated neak area

- (condensed Data) 300 Packian Sacramanto Ca.

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standard	d conc.				µg/1			µg/1	_		1/grl			µg/1
Shonsar	response from		-		area	-		area	1		area	-		area
ini lu	ul in lection		2		area	2		area	2		area	2		area
			3		area	~		Brea	3		area	3		area
RFs for	this	sheet			q/area			q/area			g/area			g/area
samole	time	amt	arca	ng/1	mean	area	1/6/	mean	area	µg/1	mean	area	µg/1	теап
1	CH. D. CHOS	CHOZ		TCA	664	TCE	EDB	PCE	Viny (Alois	8	C02	02	Na	CHY
9-421-47	_	7.0		7.0	0.08	24	40.02		/30	ري دي	22000	56000	730000	2000
74.13b.5		0.00	40.03	0.01	100001	,	(0.005	9.0	75		2600	28000	20000	28000
1-54-19	10.03	40.003		0.1	1000.07	80.0	10.0005	0.006	10.08	40.04	18000	41000	84000	73300
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1 N V C	1	40.07		0.04	10.00	7	1	70.07	807	40.4	11000	140000	000018	(3300
VW-5	، ا	Kacez	_~	0.06	(0.900/	4.0		(000.07	80.08	40.04	3400	14000	280000	(3300
P-W-		(0.007		5.0	10.07	9.0	20.00	7.0	8.07		6200	120000	86 CCC	4330C
8-M1	1	40.07		5	10.07	9	30.02	0.2	8.07	40.4	7200	85000	Bacco	< 330c
VW-7	10.3	₹0.0>		4	100.07	30	30.03	9.0	8.07	40.4	8300	36000	ezaco	4330c
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Nota	Notations:	7 T	respons	response factor interference wit	response factor interference with adjacent	t peaks		Analys	ed by De	Analysed by David Abrushovic	<i>नव</i> एका	. ગ્ર		

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	•		7.56			4.89	6		5.19			5.76		
			C#2	622		CHC	23		12-06	44		TCA		
standard	d conc.		380		µg/1	0/		ug/1	200		μg/1	8		µg/1
respons			1 304229	29	area	1 768 709	209	агеа	1 320487	487	area	1856698	368	area
int lu	ul injection		2 302776	74	area	2 759888	368	area	2312800	800	агев	2866976	176	area
		9	3225832	737	area	3748875	378	area	3 327980	980	area	3809896	396	area
PFe for this		sheet	6.8×10-15	0-15	0/area	1.32 × 10-16	91.01	q/area	x 42.7	×10-15	g/area	5.92×10-17	۴/-0/	g/area
Sample		amt.	area	ng/1	mean	area	µg/1	mean		µg/1	mean	вгеа	µg/1	mean
16 RIK 7	54:80	8	(1000	10.03		(10000)	40.000		(10000	20.03		(1000	(0.003	
]	09:03	88	410000			110000 (0.0007	€00.00		00001	50.03			(0.003	
ے ا	l	1	(1000 10.03	20.03		000017	10,0007			20.03		1500	0.003	
SVCT BIK	١.,	1	(1000)	60.03		410000	40.0007		(10000	10.03		1500c	0.003	
7.44-12P.C		j	18761	4	2	111242	0.3	₹.0	(1000)	, / >	77	344188	0.4	2.0
41:11 9-UD-67		ł	24716	3		88809	0.2		(10000)	< / >		300000	0.4	
44-411 2 - HI-47	£h:11	50	37313	7	7 4	(10000	40.03	0.006	(1000	4/3	50.03	(10000	10.07	10.01
5-40-57-45	12:01	2007	149626	3 /		97844	0.006		000017	(0.03		331086	10.0	
1/5-1/2-1	12:17	300		40.3	\$0.03	(10000	40007-40007	400007	<10000	40.3	50.07	35000	0.7	7.02
VC-1/5-1	13:35	2000	(10000 / 0.03	10.03		2/0000	(0.000-7		0000/>	10.03		788£65E	0.7	
W- 4	12:50			1	10.03	(1000)	11	10.009	7,0000	10.3	50.03	25000	0.007	20.007
7-WV	13:05		2000 (10000)	10.03			`,		22001/	10.03		2388ZG	0.007	
VW-5	13:31	700	020017	10.3	(0.3		10.007	10.007	7/0000	10.3	10.3	91138	0.03	40.04
VW-S		280	200017	10.3		000017	10.07		(10000)	40.3		143696	, 40.0	
215	13:49	T	287400	1		754802	1		2883			80000	1	
7 M V	14,05/200	28	1 1	10.3	60.03	(1000	10.003-	- 10.0007	0000/7	10.3	50.03	364687	60.0	0.06
0-W/	14:30	gg		(0.03		00000	(0.0007		20001	40.03		924424	0.03	
		R.	respons	response factor				•		AA	· · · · · · · · · · · · · · · · · · ·	,		

response factor interference with adjacent peaks not analysed es**jan**ted Notations:

Analysed by David Abranovic

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	Date /2//5/87	115/8	rk	Page 16	16									_
			5.97			6.36			7.68	a		9.8		
			C C & 4	3		7CE			EOB	8		126		
standard conc	d conc.		ત		1/gr			µg/1	8		1/gri	7		µg/1
respons	response from		1 8856 15	615	area	177233	335	area	1211012	2637	area	1/342275	2277	area
ini lu	ul injection		2 885082	83	area	2742253	153	area	2 208	2080692	агеа	21402540	25.40	area
	-	0	5245488	623	area	3708029	129	area	32198398	1398	area	36/20	3/200000	агеа
RFs for	this	sheet	2.27	2.27 × 10-17	Q/area	1.35×10-16	11-01	g/area	9.39 X	9.39 x 10-17	g/area	3.8×10-17		g/area
sample	time	amt	arca	ug/1	mean	area	µg/1	mean	area	µg/1	mean	area	µg/1	mean
)	94.80	300	2000 (10000	(0.000 /		7/0000	₹00:0>		(10000	5000.0		00001)	(0.00)	
	09:03	2000		100.07		_ 1	⟨0.000≯		110000 (0.000S	500.0>		(10000 (10.000)	6000 O)	
	10:31	300	2000 65 000	5000 O		196467	0.0		000011	50000)		000017	700007	
SVS/BK	54:81	2000	65 000 0.0003	6000.0		194312	0.01		(1000	(0.0005		000017	(0.00)	
65:01.9-86-195	10:59	25	200000	0.09	0.08	16601441	29	24	4/0000	40.02	20.02	373/2/63	38	388
41:11,9-dc1-49-95	<i>1</i> 1.11	•	\$5000 0.07	0.07		7377074	20 1		000017	10.02		350000	27	
£6: 11, 5-da-59-95	£6: II	١	(10000 (0.005		100007	520958	લ	/	000017	(0.02 -	240,0005 150,000	150000	,	8.0
56-12R5 12:01	12.01	2005	0000/>	(0.000)	. 1	12202173	0.8		0000/7	50000		788343K	0.5	
VC-WS-1	12:17	200	090017	100:07	1, 40.000/	80000	0.05	20.05	500:07 00:007	60.00S	(0.000	3000	0.00%	0.00
1/5/W-7/	12:36	3000				779932	0.05		50000 (0.000)	(0.0005		295/30	900.0	
1W-4	05:71	200	020017	10.00	10.001 - 10001	4000ad	3	3	000017	10.00	10.005	<b>50000</b>	0.01	70.0
h-N1	13:05	2000	060017	(0:00)		8816188	3		210000	coms,		540835	0.0/	
S-MA	13:21	300	020017	10.00	10007	5267782	4	4	000011	10:005	50005	00001)	10.002	7,00.05
5-M1	13:35	200	000017	10.001		5264095	, ,		2000/	10.005		(1000)	0.002	
STD	bh:E1		80000	ſ		1081236	J		1616857	ı		in sec	1	
VW-6	50.11	200	000017	(0.00)	100001	1437691		20.7	00001	500.00	30000	000017	10.00	10.00°
4. WV	14:20	2000		10001		6391653	6.4		2000/7	(0000)		000017	70.005	
		30	00000.	e factor										

RF response factor
Notations: I interference with adjacent peaks
NA not analysed
E estimated peak area

Analysed by David Abranavic

-	Date_12/15/87	18/51		Page	16	!								
		*******	1.26	97		7.18 A 022 022 0	0 2							
			Xmax	unix intorior				1/011			uq/1			µg/1
standard conc	conc.		345	1	7	005	27.0	9 4 4	-		area	1		area
response trom	E LLOM		1/52 28/2	2/2	BI ES	1 200	200					,		area
ini inj	ul injection		21695846	948	агев	25696875	875	area	7		area	7		91 29
	Banga - 100	80	3/763850	058	area	35627205	205	area	3		area	3		area
RFs for	this	sheet	1.50 × 10	× 10-15	g/area	8.36 × 10-16	91-01	q/area			g/area			g/area_
	time	amt	area	µg/1	mean	area	µg/1	mean	area	µg/1	mean	area	µg/1	mean
T.,	bh: 60	282	2000 (100000	80.05		(100000	40.04							
Ι.	20:85	$3\infty$	(10000	80.02		40.02 0000011	40.04							
AIR Same 109:41	14:60	3000	_	40.08		70.02 0000011	40.07							
SVCT BIK	81:01	2000	80.07000017	80.07		000001	10.04							
C1,-14-12P6 10:59	10:59	50.	740814h	140	730	000 000)	42	57						
41:11, 7-dc-67-67	<i>51</i> :11	50	4034924	120		000 00)/	121							
2445-12P-5	11:33	50	350/008	90	,54	250000		7						
16-45-DP-5	10:71	300	13250821	17		0251701	4 1							
VC-NS-1	12:17			8.07	10.08	((00,000	10.9	40.04						
V -NS-1	738,51		0000017	, 80.07										
h-MA	12:50		(10000	8.07	(40.08		٠,	40.04						
7 - WV	13:05	2000	(100000	, 80:07		4100000	40.04							
VW-5	13:31	300	_	8.07	8.07	(10000	10.4	40.4						
S-M1	13:35	780	I	8.07		000001	40.4							
STD	bh:E1	0				3925153	j							
VW-6	50:41	300	7	8.07	80.074	0000017	40.4	10.07						
2 W V	14:20	2000	7180000	, 80.01	ļ	000 0017	40.04							
A CN	Not at ions.	RF	response	e factor	40000	i neata		Analys	ed by Os	wid Al	Analysed by David Abranovic	.\;		

Analysed by David Abranovic

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interference with adjacent peaks not analysed effigated agak area

Notations:

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Page 1d

(3300 23300 3300 28000 14000 7014920 870000 556000 4100000 43300 + 63300 2007 <u>19</u>/1 area area g/area area mean 133001 12000 63300 00887/000017 /3300 13300 13300 43300 (3300 1100000 K3300 µg/1 10000 K3300 000 11 33 XC 00EEX | 000001. 000 ht 3865405 3.35 × 10 1842514 287760 28800 2.2.2 (100000) (1000) 0000011/0000/18 000 001/ 00000 (10000) 368804 331775 972452 8400000000 803574 C 144 49283 area **380000** area area g/area area 33000 µg/1 2000 mean 72000-000076 5812469 84000 0002/7 appoint 1.24 × 10-10 000068 637000 000098 38000 0000 25 2001 23 84000 0000 69 £018£55 70000/1200 790000 74 acc S845202 12 (000) 380000 рд/1 35976587 15962643 2 596 5094 739200 1.23 800019 6712622 6376833 1303SS 2941592 2689R10 5780319 336935 581777 area  $\neq$ 4/000 1/61 q/area Brea 140000 14000 2600 38ac mean 140000 14000 67047 34000 50000 13000 150000 0000 HI 45000 1856383 15 0000 000011891140000 126337 65000 47000 1313556 6700 000158 8251841 2100 µg/1 10-X 8/8 21704821 3/684796 1 1845268 00 968 9.43 1628022 334605 2822853 2825459 22000 918609 00001 \$ 10000 × 1815128 **३५०१९९** 346225 240861 5.13 area 18000 3900 11000 area 3400 µg/1 area g/area 2290 mean 19000 18000 4000 4000 11000 3800 0005 | 1555 | 33000 S42382 12:000 4100 00/47 1000 40000 44100 33 00 710000 c4100 3400 137088 5600 13,222 5600 411 × 10-11 1 608525 2 6585/3 3661660 26400 9.32 < 100000 1/8000 456233 432895 262427 28235 80192 202 12833 81638 41364 11891 arca Date *12/15/87* 1000 1000 800 000) 8 000/ 1000 8 8  $\alpha$ 8 8 8 B amt and 8 sheet 3:57 10:37 45:01 80:11.9-221-13-95 12:27 14:28 04:01 S5528-5 111:43 3.13 standard conc. II : 건 12:43 response from ul injection 10:34 97:11 3-doi-49-95 3:44 14:16 13:31 13:01 this time 2-921-59-18 RFs for PIP Same. SYST BIK sample HA BIKI 16-115-16-115-VW-5 7 W-4 S-MA 7~7

RF response factor
Notations: I interference with adjacent peaks
NA not analysed

estimated peak area

Analysed by David Abranovic

THACER RESEARCH CORPORATION

Date 12/15/87

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	•	<u> </u>	0110			OHO			12-DCA	B20		76.8		
standard conc	Conc.		200	· ·	uq/1			µg/1	200		1/gr/	7		µg/1
morf esponsor.	from		-		area	1		area	1		area	-		area
morabellar in		<del></del>	,		area	2		area	2		area	2		area
		0	,		area	3		агеа	3		area	2		area
PFe for	this sh	sheet	«	10-15	q/area	8 ×	91-01	q/area	6.24 × 10-15	10-15	g/area	5.92 ×1	41-01	g/area
	1	٠٠٠	1	1/gr	mean	}	µg/1	mean	area	µg/1	mean	area	µg/1	mean
1			Q	(0.3	(40.3	۵	₹0.07	₹0.0>	(1000	10.3	60.3	1303923	0.4	70.4
		300	000017	(0.3			₹0.0>	1	(1000	40.3		135,235.7	0.4	
		١.		10.3	60.3		10.007	10.00}	00001)	(0.3	503	2162275	4	5
	${}^{-}$		_	40.3			40.007		000017	10.3		616 46 981	6	
}	1		(000)	10.3	40.3	1	(0.00)	10:007	210000	10.3	10.3	13962601	4	4
	Tι	300	t	1			40.007		C10 00C	10.3		13400094	4	
	6:19	T	<del>-</del>	1			1		287589	1		\$5000	1	
3	1	2000	+	(0.03		(1000)	40.007			(0.03		(10co)	(0.003	
_	_		+-											
Notal	Notations:	※ - :	respons	response factor interference wit	response factor interference with adjacent	t peaks		Analys	Analysed by David Abranovic	id Ahra	novic	1		·

interference with adjacent peaks not analysed estimated pask atom

Job Raclian Sacramanto Ca

TRACER RESEARCH CORPORATION

Date 12/15/87

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Cay
7
area
2.27 × 10 17 g/area
µg/1
(10000 (0.001 + 10.00)
410000 40.001
(1,000) 10.00 1 (0.00)
(10000)
10.00
- 0000S
(10000) (0.000)
response factor interference with adjacent not analysed estimated peak area

THACER MESEARCH CORPORATION

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			Vinuel	Vinul aloide		Bengene	are.							
standa	standard conc.		25		µg/1	500		1/6п			ug/1			19/1
	ECT 9 GROCE		-		Area	-		area	7		area	-		area
respon	10 to 20 to		, ,		Area	2		area	2		area	2		area
	Bongare - 10	0	-		area			area	3		area	3		area
DEC for	Venya.	cheet	\$0 X	51-01	a/area	8.36 × 10-16	11-01	0/area			g/area			g/area
sample	Lime	amt	area	ng/1	mean	area	µg/1	mean	area	µg/1	mean	area	µg/1	теап
1.W-9	14:30	8	4100aco	(0.B)	8.07	Ω	[ ']	40.4						
1 M-4	TS: H1	200	<10000)	20.5		(10000	10.4							
8-M7	15:10	38	8-07 0000017	809	10.8		10.9	70.7						
W-8		8	2000/7	(0.8)			10,4							
1W-7	15:51	200		60.6	8.07		10.4	40.4						
4-11-1	16:05	200	10000 40.8	Ì		000001	10.4							
(17)	81:18	9	155/917	ı		859h bbh	ſ							
PINC				80.0		(leader)	40.01							
DAY ALL			2000	*										
	_													
	_													
	-													
	_													
	-													
	-													
		_												
Not	Notations:	RF ~	respons	response factor interference with adjacent	h ad tacen	t peaks		Analys	ed by Oc	Drid Ab	Analysed by David Abranovic	V		

interference with adjacent peaks not analysed equipted

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Date 12 /15/87

Page 2d

1	1	ł											
					S			4/2			CHY		
standard conc	٠	2640	00	ug/1	0	00	ug/1	739200	00	1/6/	288 00		µg/1
( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( )	•			area	_		area	1		area	1		area
response 11 on	Į (	, ,		area	2		area	2		area	2		area
מז זוו לברנטוו	28/	, ,		8010	~		area	3		area	3		area
Pre for this	shoot	11.0/×11/h	11-0	0/area	. /3 ×	11-01	g/area	1.24 x	01-01	q/area	3.35 X	<b>"-0</b>	g/area
٩		arca	ng/1	mean	area	µg/1	mean	area	µg/1	mean	area	ng/1	mean
	<del></del>	<del>                                     </del>	6300	6200	2280182	120000	1,2000	7083004	280000	860000	860000 1100000	<b>43300</b>	<330C
	<del>                                     </del>	8658/1	0019		2287123 120060	120000		6879265	\$5,0000		<del></del>	(3300)	
	$\Box$	133481	7306	5200	833499	_	285000	0583571	31000	200001) 000088	-+	× 3300	(330C
			, 00 /2		630629			02.25802	000088		0000017	(3300)	
	000/	F01102	0016	2800	528658 27-000	27.000	36000	26808, 8300C	- 4	<i>७००</i> स्थ	(100000 (3300)	(3300	<330c
	(20)	11105/	9700		,0005h 895 898	45000 A		000098 7898412	86000		7 000017	43300	
Π		875HUM	,		87.1979	-		538748	,		801552	1	
6	+	7	03/4/		00006 7198661	0000	ŀ	6218489	33000		(100000	73300	
_	1	T	_										
	-												
	-		-										
	+												
	-												
	-												
	-												
Notations:	RF S: I NA E	response factinterference not analysed estimated pea	fact nce sed pea	or with adjacent k area	t peaks		Analysed b Checked by	ed by Oo	Analysed by Oovid Abranovic	anokke	J		

Question	YES	МО	Comment
CALIBRATION PROCEDURES			
Was a fresh standard prepared today?	<u>/</u>		
Was the standard water analyzed   for contamination prior to making   standards?	<u> </u>		
Was the standard analyzed three   times at the start of the day?	$\sqrt{}$		
Was the response factor (RF)   calculated for each component?   (See example field data sheet)	<u> </u>		
Was the standard injected after every fifth sample?	V	` <u> </u>	
Was the RF ≤20 percent?	1	N/A	
If not, was corrective action taken?		N//	4
DOCUMENTATION			
Is the sample ID written on every chromatogram?		_	
Was the probe number noted in the log book?			
Can the field data sheets be tracked to the original chromatograms?	_		
Has the field log book been filled out with the correct information? (See QAPP Section 1.8.3.8)			
Have all of the chemists' calculations been checked by the field technician?	_		

Date	_			
Init	La:	Ls _		
Page	2	of	3	

Question	YES	NO	Comment
ANALYTICAL AND AVSTEM OC	1		
Were at least two syringes of each size blanked at the start of the day?	<u> </u>	*********	
Were the ambient air concentrations <.01 ug/1?	_		Oz & Nz No
Was pure nitrogen used as the blank gas?			
Have the syringes been properly cleaned?	1		
Was a system blank run at the start of the day? (See QAPP Section 1.8.3.3)	   		WILL DO.
Was a system blank run after every 10 samples?	<u> </u>		
Was the system blank collected concurrent with the ambient air sample?	   		
Were system blanks taken at locations away from actual soil-gas sampling locations?	<u> </u>	$\lambda_{m}$	NO
Was the first soil-gas probe at each site used as the "unknown" sample and analyzed twice (duplicate analyses)? (Use first perimeter if gas probe is not taken)	✓		<b>,</b>
Was the relative difference ≤25 percent?	   		
If not, was corrective action taken? (See QAPP Section 1.8.3.4)			

Date	_			
Initi	a	Ls		_
Page	3	of	3	_

Question	<del></del>	YES	NO	Comment
SAMPLING OC Were all probes cleaned prior to use?	1	<u>/</u>	_	
Were all adaptors cleaned prior to use?	1	_		
ADDITIONAL COMMENTS				
		······································		
		<del></del>		
		· · · · · ·		
			<del></del>	
			<del></del>	

Date 2.7.67
Initials MAR
Page 1 of 3

SOIL-GAS P		LING TURELL	. 0859
Question	YES	NO	Comment
CALIBRATION PROCEDURES			
Was a fresh standard prepared   today?	<u> </u>		(me)
Was the standard water analyzed for contamination prior to making standards?	_		
Was the standard analyzed three times at the start of the day?	<u> </u>		
Was the response factor (RF) { calculated for each component? (See example field data sheet)	<u> w</u>	1	NOT BASED ON PREVIOUS PERPONSE (WILL BE)
Was the standard injected after every fifth sample?	<u>/</u>		(will be)
Was the RF ≤20 percent?	<u>/</u>		NA
If not, was corrective action taken?			NIA
DOCUMENTATION			
Is the sample ID written on every chromatogram?	_		
Was the probe number noted in the log book?	~		
Can the field data sheets be tracked to the original chromatograms?	<u>~</u>		
Has the field log book been filled out with the correct information? (See QAPP Section 1.8.3.8)	<u> </u>		
Have all of the chemists' calculations been checked by the field technician?			NAT ( NOT APPLICABLE NATTING TIME)

Date	_			
Init	La:	Ls _		
Page	2	of	3	

Question	YES NO Comment
ANALYTICAL AND SYSTEM OC	
Were at least two syringes of each size blanked at the start of the day?	<u></u>
Were the ambient air concentrations   <.01 ug/1?	V _ Except (or or
Was pure nitrogen used as the blank gas?	<u> </u>
Have the syringes been properly cleaned?	<u>~</u> _
Was a system blank run at the start of the day? (See QAPP Section 1.8.3.3)	_ NATT
Was a system blank run after every 10 samples?	NAFT NIA
Was the system blank collected concurrent with the ambient air sample?	NATT
Were system blanks taken at locations away from actual soil-gas sampling locations?	- + will is
Was the first soil-gas probe at each site used as the "unknown" sample and analyzed twice (duplicate analyses)? (Use first perimeter if gas probe is not taken)	NATT
Was the relative difference ≤25 percent?	NATT
If not, was corrective action taken?   (See QAPP Section 1.8.3.4)	~ NP

Date	_			
Initi	la:	Ls _		
Page	3	of	3	

Question	<del></del>	YES	МО	Comment
SAMPLING OC	1			
Were all probes cleaned prior to use?	ŀ			
Were all adaptors cleaned prior to use?	 	<u> </u>		
ADDITIONAL COMMENTS				
			<del></del>	
				<del></del>
	<del></del> -			
				·——————————

Date 12.587
Initials \_\_\_\_\_
Page 1 of 3

Question	YES NO Comment	<del></del>
CALIBRATION PROCEDURES	,	
Was a fresh standard prepared today?	- Je discussed checked a	gainst pre
Was the standard water analyzed for contamination prior to making standards?	(yesterday's wa	kr/
Was the standard analyzed three times at the start of the day?		
Was the response factor (RF) calculated for each component? (See example field data sheet)	<u>~</u> _	
Was the standard injected after every fifth sample?	- NATT	
Was the RF ≤20 percent?	<u> </u>	
If not, was corrective action taken?	vA	
DOCUMENTATION		
Is the sample ID written on every chromatogram?		
Was the probe number noted in the log book?	<u> </u>	
Can the field data sheets be tracked to the original chromatograms?		
Has the field log book been filled out with the correct information? (See QAPP Section 1.8.3.8)	<u> </u>	
Have all of the chemists' calculations been checked by the field technician?	_ I NEGO PROF. CALL	٤.

Date				
Initi	la.	Ls _		
Page	2	of	3	

Question	YES	NO	Comment
ANALYTICAL AND SYSTEM OC			
Were at least two syringes of each size blanked at the start of the day?	_		
Were the ambient air concentrations <.01 ug/l?	_		
Was pure nitrogen used as the blank gas?	<u>~</u>		
Have the syringes been properly cleaned?	$\underline{\checkmark}$		
Was a system blank run at the start of the day? (See QAPP Section 1.8.3.3)	<u>.</u>		
Was a system blank run after every 10 samples?			NATO DA
Was the system blank collected concurrent with the ambient air sample?	_		,
Were system blanks taken at locations away from actual soil-gas sampling locations?	<u> </u>		
Was the first soil-gas probe at each site used as the "unknown" sample and analyzed twice (duplicate anayses)? (Use first perimeter if gas probe is not taken)	<u> </u>		
Was the relative difference ≤25 percent?			
If not, was corrective action taken? (See QAPP Section 1.8.3.4)			

Date	_			
Init	La:	ls _		
Page	3	of	3	

Question		YES	NO	Comment
SAMPLING OC Were all probes cleaned prior to use?	 		/	probes / AS CLEAR BELL "BRANCED"
Were all adaptors cleaned prior to use?	1	_	<u> </u>	BELD "BRANCED"
ADDITIONAL COMMENTS				
			<del></del>	
		·		
		·· <u>·</u>	<del> </del>	<del> </del>

Date <u>12.787</u> Initials <u>NAR</u> Page 1 of 3

Question	YES	МО	Comment
CALIBRATION PROCEDURES	<b>.</b>		
Was a fresh standard prepared today?		/	NO AS DISCUSSED PRICE
Was the standard water analyzed for contamination prior to making standards?		1	SAME WATER AS BLEORE
Was the standard analyzed three times at the start of the day?	1		
Was the response factor (RF) calculated for each component? (See example field data sheet)	<u>'</u>		
Was the standard injected after every fifth sample?	<u> </u>	_ <del></del>	
Was the RF ≤20 percent?	1		
If not, was corrective action taken?			
DOGUMENTATION			
Is the sample ID written on every chromatogram?	<u>~</u>		
Was the probe number noted in the log book?			
Can the field data sheets be tracked to the original chromatograms?	<u>√</u>		
Has the field log book been filled out with the correct information? (See QAPP Section 1.8.3.8)			
Have all of the chemists' calculations been checked by the field technician?			

Date				
Init	la:	Ls .		
Page	2	of	3	

Question	YES	NO	Comment	
ANALYTICAL AND SYSTEM OC				
Were at least two syringes of each size blanked at the start of the day?	4			
Were the ambient air concentrations < .01 ug/1?	<u>~</u>			
Was pure nitrogen used as the blank   gas?	~			
Have the syringes been properly cleaned?	4			
Was a system blank run at the start of the day? (See QAPP Section 1.8.3.3)	_			
Was a system blank run after every 10 samples?	<u>/</u>			
Was the system blank collected concurrent with the ambient air sample?	_	,		
Were system blanks taken at locations away from actual soil-gas sampling locations?				
Was the first soil-gas probe at each site used as the "unknown" sample and analyzed twice (duplicate analyses)? (Use first perimeter if gas probe is not taken)	<u>/</u>			
Was the relative difference ≤25 percent?				
If not, was corrective action taken? (See QAPP Section 1.8.3.4)		_		

Date	_			
Initi	a	ls _		
Page	3	of	3	

Question	YES	NO	Comment	
SAMPLING OC  Were all probes cleaned prior to use?  Were all adaptors cleaned prior to use?		, — , —		
ADDITIONAL COMMENTS	TOLMAN	Sitouc	) Do fpm	CALC. S
			<del></del>	

Question	YES	NO	Commer	nt
CALIBRATION PROCEDURES	1			
Was a fresh standard prepared today?		<u>✓</u>	PREPARED	12-7-87
Was the standard water analyzed for contamination prior to making standards?			12-7-87	
Was the standard analyzed three times at the start of the day?	$ \mathcal{L} $			
Was the response factor (RF) calculated for each component? (See example field data sheet)	J			
Was the standard injected after every fifth sample?	$\sqrt{}$			
Was the RF ≤20 percent?	1			
If not, was corrective action taken?				
DOCUMENTATION				
Is the sample ID written on every chromatogram?	$\checkmark$			
Was the probe number noted in the log book?	$\sqrt{}$			
Can the field data sheets be tracked to the original chromatograms?	$ \sqrt{} $			
Has the field log book been filled out with the correct information? (See QAPP Section 1.8.3.8)				
Have all of the chemists' calculations been checked by the field technician?	-	1		

Question	YES	NO	Comment
ANALYTICAL AND SYSTEM OC			
Were at least two syringes of each size blanked at the start of the day?	$\checkmark$		
Were the ambient air concentrations   <.01 ug/l?	<u> </u>		840
Was pure nitrogen used as the blank   gas?	<u> </u>		in ECO
Have the syringes been properly   cleaned?	1		
Was a system blank run at the start   of the day? (See QAPP Section   1.8.3.3)	<u> </u>	_	
Was a system blank run after every   10 samples?			
Was the system blank collected   concurrent with the ambient air   sample?	<u> </u>		
Were system blanks taken at loca- tions away from actual soil-gas sampling locations?	<u> </u>		
Was the first soil-gas probe at each site used as the "unknown" sample and analyzed twice (duplicate anayses)? (Use first perimeter if gas probe is not taken)	<u> </u>		Every sample are
Was the relative difference ≤25 percent?	<u> </u>		
If not, was corrective action taken? (See QAPP Section 1.8.3.4)			

Date 12-9-8)
Initials 130
Page 3 of 3

Question		YES	МО	Comment
use?	OC probes cleaned prior to adaptors cleaned prior			
additiona Profe		obe tal	aur	at SG3069L.  y from origin

Date 10-10-87 Initials DP Page 1 of 3

Question	YES	ИО	Comment
CALIBRATION PROCEDURES			
Was a fresh standard prepared today?	$\checkmark$		
Was the standard water analyzed for contamination prior to making standards?	✓		
Was the standard analyzed three times at the start of the day?	✓		
Was the response factor (RF) calculated for each component? (See example field data sheet)			
Was the standard injected after every fifth sample?			
Was the RF ≤20 percent?	~		
If not, was corrective action taken?			
DOCUMENTATION	,		
Is the sample ID written on every chromatogram?			
Was the probe number noted in the log book?			
Can the field data sheets be tracked to the original chromatograms?	$\sqrt{}$		
Has the field log book been filled out with the correct information? (See QAPP Section 1.8.3.8)	$\checkmark$		
Have all of the chemists' calculations been checked by the field technician?	1		

Date 12-10-67 Initials DLP Page 2 of 3

Question	YES	NO	Comment
ANALYTICAL AND SYSTEM OC			
Were at least two syringes of each size blanked at the start of the day?	$\checkmark$		
Were the ambient air concentrations <.01 ug/1?			
Was pure nitrogen used as the blank gas?	✓		
Have the syringes been properly cleaned?	_		
Was a system blank run at the start of the day? (See QAPP Section 1.8.3.3)	<u>√</u>		
Was a system blank run after every 10 samples?	$\checkmark$		
Was the system blank collected concurrent with the ambient air sample?	✓		
Were system blanks taken at loca- tions away from actual soil-gas sampling locations?	<u> </u>		
Was the first soil-gas probe at each site used as the "unknown" sample and analyzed twice (duplicate anayses)? (Use first perimeter if gas probe is not taken)	<u> </u>		
Was the relative difference ≤25 percent?	$\checkmark$		
If not, was corrective action taken? (See QAPP Section 1.8.3.4)			

Date /2-/0-87 Initials OLP Page 3 of 3

Question		YES	МО	Comment
SAMPLING OC  Were all probes cleaned prior to use?  Were all adaptors cleaned prior	1	<u>/</u>		
to use?	1	V		
ADDITIONAL COMMENTS				
		<del></del>	<del></del>	<del></del>
				<del></del>
	<del></del>			

Date Division Initials Dip Page 1 of 3

Question	YES	NO	Comment
CALIBRATION PROCEDURES			
Was a fresh standard prepared today?		<u> </u>	12-10-87
Was the standard water analyzed for contamination prior to making standards?	./		
s candards (	<del></del>		
Was the standard analyzed three times at the start of the day?	<u>/</u>		
Was the response factor (RF) calculated for each component? (See example field data sheet)	<u> </u>		
Was the standard injected after every fifth sample?	<u>Y</u>		
Was the RF ≤20 percent?	V		
If not, was corrective action taken?			
DOCUMENTATION	1		
Is the sample ID written on every chromatogram?	<u> </u>		
Was the probe number noted in the log book?	<u> </u>		
Can the field data sheets be tracked to the original chromatograms?	<u>V</u>		
Has the field log book been filled out with the correct information? (See QAPP Section 1.8.3.8)	<u> </u>		
Have all of the chemists' calculations been checked by the field technician?	<u> </u>		

Date 2-11-87 Initials Page 2 of 3

Question	YES	NO	Comment
ANALYTICAL AND SYSTEM OC			
Were at least two syringes of each size blanked at the start of the lay?	V	_	
Were the ambient air concentrations   <.01 ug/1?		<u> </u>	DETECTION LIMITS VA
Was pure nitrogen used as the blank	1		
Have the syringes been properly cleaned?	<u> </u>		
Was a system blank run at the start of the day? (See QAPP Section 1.8.3.3)	✓		
Was a system blank run after every	<u>~</u>		
Was the system blank collected concurrent with the ambient air sample?			
Were system blanks taken at loca- tions away from actual soil-gas sampling locations?	<u> </u>		
Was the first soil-gas probe at each site used as the "unknown" sample and analyzed twice (duplicate anayses)? (Use first perimeter if gas probe is not taken)	<u>/</u>		al twice
Was the relative difference ≤25 percent?	$\sqrt{}$		
If not, was corrective action taken? (See QAPP Section 1.8.3.4)			

Question		YES	NO	Comment
SAMPLING OC  Were all probes cleaned prior to use?  Were all adaptors cleaned prior to use?	1	<u>V</u>		
ADDITIONAL COMMENTS				

uestion	YES	NO	Comment
LIBRATION PROCEDURES			
as a fresh standard prepared { oday?		<u> </u>	(12-10-87) Compriso previo
is the standard water analyzed   or contamination prior to making   candards?	<u> </u>		
as the standard analyzed three   imes at the start of the day?	<u> </u>		
as the response factor (RF) alculated for each component? See example field data sheet)	<u>/</u>		
as the standard injected after very fifth sample?	<u></u>		
as the RF ≤20 percent?	_/		
f not, was corrective action aken?	_	_	
OCUMENTATION			
s the sample ID written on very chromatogram?	$\sqrt{}$		
as the probe number noted in ne log book?	<u> </u>		
an the field data sheets be racked to the original hromatograms?	$\sqrt{}$		
as the field log book been filled ut with the correct information? See QAPP Section 1.8.3.8)	<u>J</u>		
ave all of the chemists' calcu- ations been checked by the field echnician?		<u> </u>	

Date D-14-87 Initials OLP Page 2 of 3

Question	YES	МО	Comment
ANALYTICAL AND SYSTEM OC			
Were at least two syringes of each size blanked at the start of the day?	<u> </u>		
Were the ambient air concentrations <.01 ug/1?	$\frac{\checkmark}{}$		
Was pure nitrogen used as the blank gas?	$\frac{\checkmark}{}$		
Have the syringes been properly cleaned?	<u> </u>		
Was a system blank run at the start of the day? (See QAPP Section 1.8.3.3)	$\checkmark$		
Was a system blank run after every 10 samples?	$\sqrt{}$		
Was the system blank collected concurrent with the ambient air sample?	$\checkmark$		
Were system blanks taken at locations away from actual soil-gas sampling locations?			
Was the first soil-gas probe at each site used as the "unknown" sample and analyzed twice (duplicate anayses)? (Use first perimeter if gas probe is not taken)	<u> </u>		
Was the relative difference ≤25 percent?	<u> </u>		
If not, was corrective action taken? (See QAPP Section 1.8.3.4)			

Date D-14-57
Initials DLP
Page 3 of 3

Question		YES	NO	Comment
SAMPLING OC	1			
Were all probes cleaned prior to use?	1	$\frac{\checkmark}{}$		
Were all adaptors cleaned prior to use?	 	<u> </u>		
ADDITIONAL COMMENTS				
		<del></del>		
	<del></del>			·

Date D-5-87
Initials D-9
Page 1 of 3

Question	YES	NO	Comment
CALIBRATION PROCEDURES	] !		area count
Was a fresh standard prepared today?		<u>✓</u>	checked w 12-10-87 previous a
Was the standard water analyzed for contamination prior to making standards?	✓		
Was the standard analyzed three times at the start of the day?	<u>√</u>		
Was the response factor (RF) calculated for each component? (See example field data sheet)	<u> </u>		
Was the standard injected after every fifth sample?	4		
Was the RF ≤20 percent?	$\leq$		
If not, was corrective action taken?			
DOCUMENTATION			
Is the sample ID written on every chromatogram?	<u> </u>		
Was the probe number noted in the log book?			
Can the field data sheets be tracked to the original chromatograms?			
Has the field log book been filled out with the correct information? (See QAPP Section 1.8.3.8)	1		
Have all of the chemists' calculations been checked by the field technician?	     	$\sqrt{}$	

Question	YES	NO	Comment
ANALYTICAL AND SYSTEM OC			
Were at least two syringes of each size blanked at the start of the day?	$\sqrt{}$		
Were the ambient air concentrations <.01 ug/l?	$\checkmark$		
Was pure nitrogen used as the blank gas?	<u>√</u>		
Have the syringes been properly   cleaned?	$\frac{}{}$		
Was a system blank run at the start of the day? (See QAPP Section 1.8.3.3)	<u>~</u>		
Was a system blank run after every 10 samples?	<u> </u>		
Was the system blank collected concurrent with the ambient air sample?	<u>/</u>		
Were system blanks taken at locations away from actual soil-gas sampling locations?	<u> </u>	_	
Was the first soil-gas probe at each site used as the "unknown" sample and analyzed twice (duplicate analyses)? (Use first perimeter if gas probe is not taken)	<u>J</u>		
Was the relative difference ≤25   percent?	$\checkmark$		
If not, was corrective action taken? (See QAPP Section 1.8.3.4)			

Date 2-/5-87 Initials DLP Page 3 of 3

Question	YES	NO	Comment
SAMPLING OC  Were all probes cleaned prior to use?  Were all adaptors cleaned prior to use?	\ \frac{1}{\lambda}		
ADDITIONAL COMMENTS			
		· <del></del>	
		<del> </del>	
		<del></del>	

APPENDIX D

Site Photographs

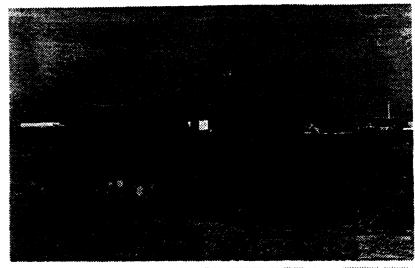


FIGURE 1. Photograph taken at the southern edge of Site No. 7, looking from south to north across the site.

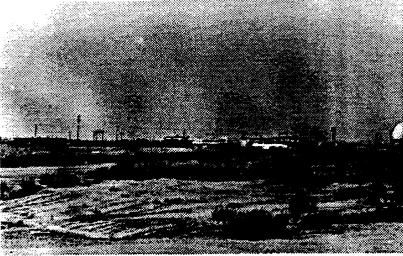


FIGURE 2. Photograph taken west of Sites No. 10, 11 12 & 13 which are in the background. Photo taken 150 feet west of Building 779, looking from northeast to southwest.

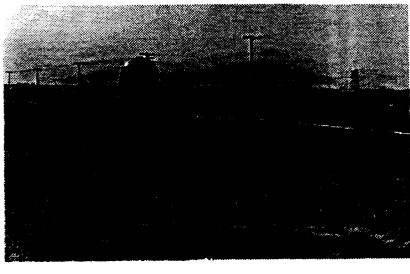


FIGURE 3. Photograph taken on the north side of Site No. 14 looking from northeast to southwest. Patrol Road is in the background.

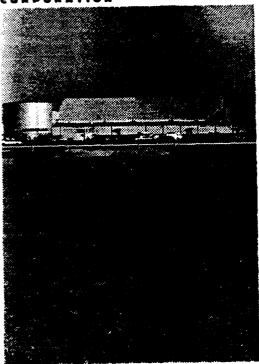


FIGURE 4. Photograph across the middle of Site No. 22 looking from south to north toward Building 704.

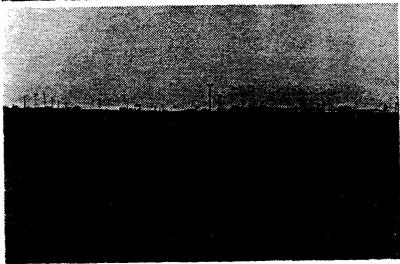


FIGURE 5. Photograph taken on Site No. 24, looking from northeast to southwest toward Building 621.

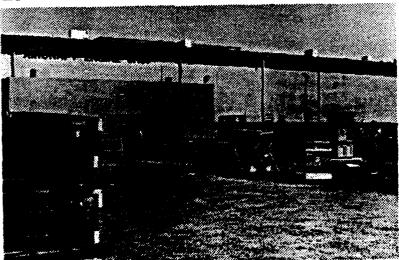


FIGURE 6. Photograph taken at the southern edge of Site No. 38, looking from southwest to northeast toward Building 475.

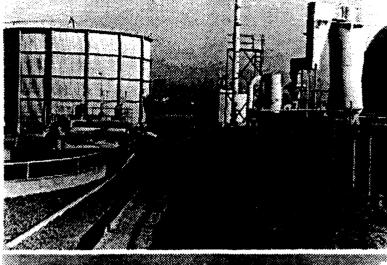


FIGURE 7. Photograph taken at the southern edge of Site No. 42, looking from south to north across the western tip of the site. Building 704 is at the right in the background.



FIGURE 8. Photograph taken at the
eastern edge of Site No.
43, looking from east to
west toward Patrol
Road. The four posts
in the center of the
picture mark Monitor
Well 34S.



FIGURE 9. Photograph taken at the western edge of Site No. 69, looking from southwest to northeast across the site toward Building 792.

## APPENDIX E

Radian Vapor Well Volume and Vent Cap Calculations

Note: The following calculation sheet presents the calculations used to estimate the volumes of air purged from the vapor well and vent cap sampling points prior to sampling.

## **GENERAL COMPUTATION SHEET**

CLIENT NAME MCCLELLAN AFB PROJECT NAME CACDERANI SUIAT

CALCULATION SET				
Prelim.				
Final				
	<del></del> -			
Sheet Of Z				
Charge #				
Rev.	Comp. By	Chk'd By		
{				
į	Date	Date		
}	Date	Date		

RADIAN VAPOR WELL VOLUME CALLULATIONS

VOLUME OF A CYCINGER Y= Trich

h = 3 FEET h = 1 INCH OR 0.083 FEET Tr = 3. HZ 1 CUBIC FOOT = 28.32 LITTES WHERE

VOLUME = 3.142 (0.083)2/3)

= 0.0649 CUBIC FEET

= 1.837 LITERS

VOLUME OF TUBING TO CAP

h= 100 (MAXIMUM)

T= 0.125 INCHES = 0.01042 FEST

3.112 (0.01042)2(100) V=

V= 0.0341 CUBIC FEET

V= 0.966 LITERS

## GENERAL COMPUTATION SHEET

CLIENT NAME	McCLEMAN AFB	
PROJECT NAME	CACTERNO SWAT	

CALCULATION SET				
Prelim	•			
Final				
Sheet Z Of Z				
Charge #				
Rev.	Comp. By	Chk'd By		
]	Date	Date		
]	Date	Date		

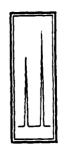
AREA D VENT CAP VOLUME

$$h = 3 + 2 + 1.5 + 0.5 = 7$$
 FEET  
 $f = 2$  INCITES = 0.1669 FEET

$$V = 3.142 (0.1667)^2 (7)$$
 $V = 0.611$  Cubic feet
 $V = 17.3$  Liters

#### APPENDIX F

Quality Assurance/Quality Control Checklist, Single-Point and Multi-Point Calibration Curves



#### INSTRUMENT, DETECTOR AND COLUMN FOR EACH ANALYTE

Two Varian model 3300 gas chromatographs were used for each analysis.

Carbon Dioxide (CO2), Oxygen (O2), Nitrogen (N2) and Methane (CH4) were all analyzed on an Alltech CTR I column using a Thermal Conductivity Detector (TCD).

Methylene Chloride (CH2C12), 1,2-Dichloroethane (DCA), Chloroform (CHCl3), 1,1,1-Trichloroethane (TCA), Carbon Tetrachloride (CC14), Trichloroethene (TCE), 1,2-Dibromoethane (EDB) and Tetrachloroethene (PCE) were analyzed on a 6 foot by 0.125 inch stainless steel column packed with 68/80 mesh 0.1% SP-1000 on Carbopac B using an Electron Capture Detector (ECD).

Benzene and Vinyl Choloride were analyzed on the above column using a Photo Ionization Detector (PID) manufactured by Photovac.

#### MULTIPOINT CALIBRATION DATA

COMPOUND	RELATIVE MASSES/ RESPONSES	CORRELATION (R)
CO2 O2 N2 CH4 Benzene EDB DCA CH2C12 PCE CC14 TCA TCE CHC13 Viny1 Chloride	1/364501, 2/698301, 4/1141666 1/490047, 2/814260, 4/1681639 1/3328125, 2/6461679, 4/13086719 1/462476, 2/973511, 4/1895332 1/2500000*, 1.4/5200000*, 2/10500000* 1/537668, 1.4/757249, 2/1163340 1/90000*, 1.4/99157, 2/183301 1/95000*, 1.4/135306, 2/191218 1/524457, 1.4/704770, 2/1096821 1/342041, 1.4/547650, 2/866588 1/330510, 1.4/437469, 2/654567 1/293761, 1.4/441874, 2/651279 1/205175, 1.4/307595, 2/505777	0.994 0.997 0.999 0.998 0.998 0.949 0.999 0.995 0.999 0.997 0.999

<sup>\*</sup> Estimated peak area